Administration Report on Railways in India for 1880-81

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ADMINISTRATION REPORT

ON

RAILWAYS IN INDIA

FOR

1880-81.

BY

COLONEL W. S. TREVOR, V.C., R.E.,
DIRECTOR GENERAL OF RAILWAYS.

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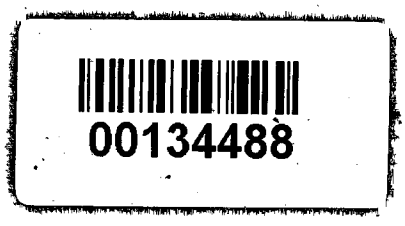

CONTENTS.

PAGE

DIAGRAM No. 1—Showing the Principal Centres of Traffic on Railways in India for the year 1880.

„ No. 2—Showing approximately, per Open Mile, the Gross Traffic, Inwards and Outwards, on Railways in India for the year 1880.

„ No. 3—Showing Open Mileage of State Railways and Gross Earnings of Guaranteed Railways from 1871 to 1880.

INTRODUCTION ... ... i-ii

CHAPTER I.—General Remarks 1

„ II.—Précis of Leading Events on Railways in India during 1880-81. 13

„ III.—Construction and Survey 31

„ IV.—Open Line 59

„ V.—Administration of Railways in India—Indian Coal—Review of Fine Funds. 207

„ VI.—History of the Gauge in India 215

„ VII.—Stores 251

„ VIII.—Details of the Principal Railways in India 253

„ IX.—Statistics 259

APPENDIX A.—Statement showing Length of Railways in India constructed and in progress, together with names of chief Officers administering them. i

„ B.—New Contract with the East Indian Railway Company... v

„ C.—Agreement between the Secretary of State for India and the Bengal Central Railway Company. xv

„ D.—Proceedings of the Railway Conferences held in Calcutta in 1879 and 1880. xxv

„ E.—Effects of Wind Pressure upon Railway Structures ... xlv

„ F.—Statement showing extent of Employment of Natives as Engine Drivers and Shunters on Indian Railways during 1880. liii

INDEX MAP.—Punjab and North-West Frontier.

„ Indus Valley and Kattyawar.

„ Rajputana and North-Western Provinces.

„ Bengal and Central Provinces.

„ Bombay and Rajputana.

„ Madras and Southern India.

„ Burma.

DIAGRAM No. I.
SHEWING THE
PRINCIPAL CENTRES OF TRAFFIC
ON RAILWAYS IN INDIA.
FOR THE YEAR 1880.
Scale 90 miles to 1 inch.
Note
AFGHANISTAN
BELUCHISTAN
RAJPUTANA
CENTRAL PROVINCES
BERAR
HYDERABAD
MYSORE
CEYLON
BRITISH BURMA
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
REFERENCE
NOTE.—Railway Stations are coloured whose gross traffic inwards and outwards during 1880 has amounted to Rs 5,00,000 or more.
The annual Traffic at any Station is expressed by the area of a Circle. A circle of ⅛ inch radius represents an Annual Traffic, inwards and outwards, of Rs. 5,00,000. Thus the radius for any other Traffic (say T.) = ⅛ √(T./5,00,000)
The black figures in the circles denote this Annual Traffic in thousands of rupees. Thus Allahabad 2614 means that the Traffic, inwards and outwards, dealt with during 1880 at Allahabad has amounted to Rs. 26,14,000. When a place is served by more than one Railway the circle represents the aggregate Traffic of the several Lines.

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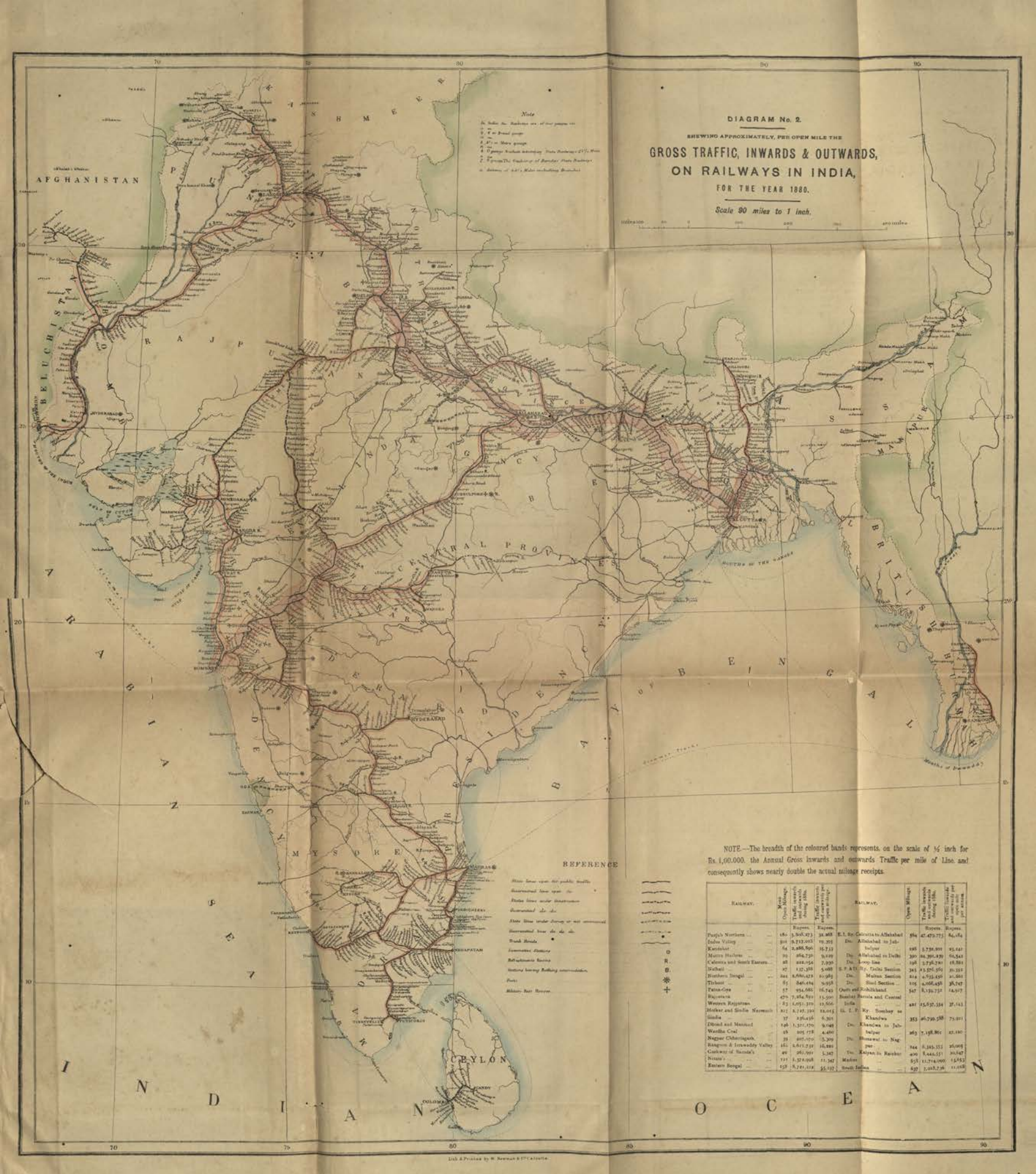
DIAGRAM No. 2.
SHEWING APPROXIMATELY, PER OPEN MILE THE
GROSS TRAFFIC, INWARDS & OUTWARDS,
ON RAILWAYS IN INDIA,
FOR THE YEAR 1880.
Scale 90 miles to 1 inch.
Note
AFGHANISTAN
BELUCHISTAN
RAJPUTANA
CENTRAL PROVINCES
HYDERABAD
MYSORE
CEYLON
INDIAN OCEAN
BAY OF BENGAL
REFERENCE
NOTE.—The breadth of the colored bands represents, on the scale of 1/6 inch for Rs. 1,00,000, the Annual Gross inwards and outwards Traffic per mile of Line, and consequently shows nearly double the actual mileage receipts.

Railway.	Miles Open.	Traffic inwards and outwards during 1880.	Traffic inwards and outwards per open mile.
		Rupees.	Rupees.
Punjab Northern	180	3,808,273	21,168
Indus Valley	302	6,712,003	19,305
Kandahar	64	2,286,896	35,733
Murree Hailway ...	30	264,730	9,129
Calcutta and South Eastern ...	28	222,054	7,930
Mahsul	27	137,368	5,088
Northern Bengal	220	2,660,472	10,583
Tirhoot	83	846,424	9,958
Patna-Gya	57	954,685	16,749
Rajputana	470	7,284,850	15,500
Western Rajputana ...	83	1,051,310	12,666
Mekker and Sindhi Sagar ...	217	2,747,320	12,615
Sindia	37	236,436	6,361
Dhond and Manmad ...	146	1,371,170	9,049
Wardha Coal	18	105,178	4,460
Nagpur Chhattisgarh ...	39	207,070	5,309
Rangoon & Irrawaddy Valley ...	161	2,611,732	16,220
Cashmere (Jammu's ...	40	361,691	9,342
Nizam's	121	1,372,098	11,347
Eastern Bengal	158	8,721,212	55,197

Railway.	Open Mileage.	Traffic inwards and outwards during 1880.	Traffic inwards and outwards per open mile.
		Rupees.	Rupees.
E.I. Ry. Calcutta to Allahabad	864	47,472,773	54,484
Do. Allahabad to Jubbulpur ...	226	5,732,202	25,242
Do. Allahabad to Delhi ...	390	24,391,239	62,542
Do. Loop-line	198	3,736,720	18,861
Do. Telihi Section ...	324	13,576,569	41,912
Do. Mutton Section ...	214	6,753,456	31,661
Do. Sind Section	105	4,066,456	38,747
Oudh and Rohilkhand ...	547	8,139,752	14,917
Bombay Baroda and Central India	481	15,637,354	32,543
G. I. P. Ry. Bombay to Khandwa	353	26,790,588	75,901
Do. Khandwa to Jubbulpur	363	7,158,801	27,180
Do. Bhusawal to Nagpur	244	6,345,353	26,005
Do. Kalyan to Raichur ...	409	8,442,551	20,647
Madras	836	11,714,000	14,653
South Indian	637	7,018,736	11,018

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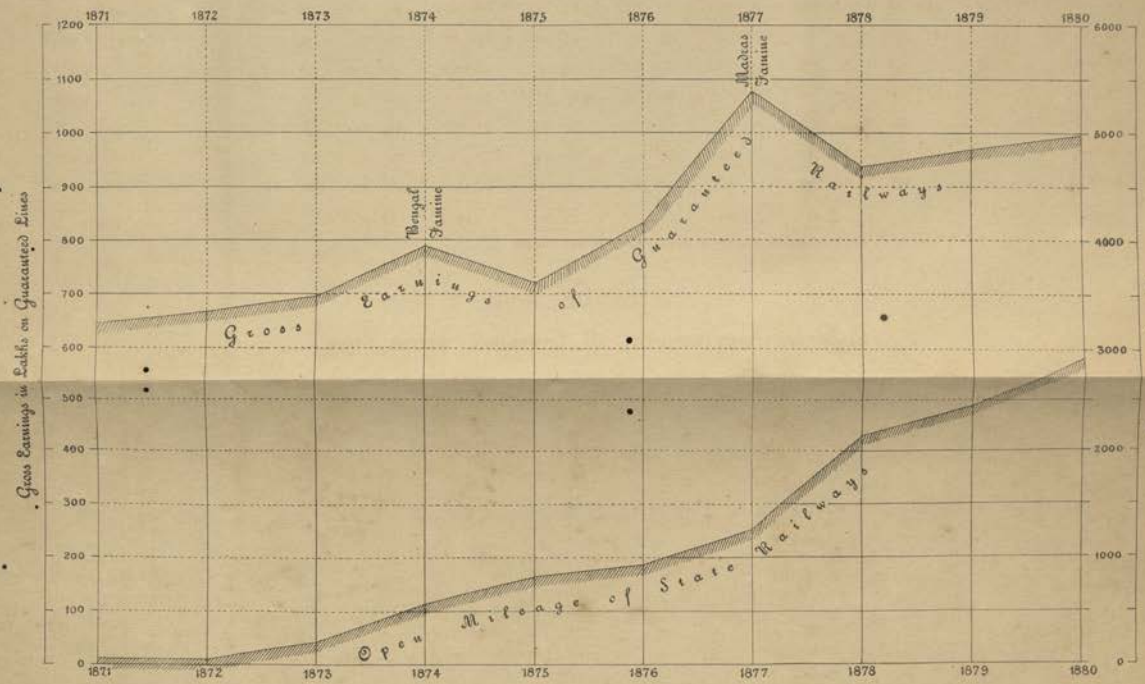
DIAGRAM Nº 3.

SHEWING OPEN MILEAGE OF STATE RAILWAYS AND GROSS EARNINGS OF GUARANTEED RAILWAYS FROM 1871 TO 1880.

YEARS	GROSS EARNINGS OF GUARANTEED RAILWAYS IN LAKHS									
	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880
E. I. RAILWAY	265·16	288·53	299·35	371·69	293·08	354·44	443·06	397·37	432·87	429·14
E. B. RAILWAY	21·98	28·02	30·85	35·65	29·34	33·01	43·56	42·17	40·66	44·51
S. P. D. RY.	42·25	46·42	53·16	66·03	55·85	64·37	83·37	80·82	109·66	121·68
MADRAS RY.	59·90	62·06	68·83	59·07	64·30	71·14	100·35	66·30	66·26	61·63
G. I. P. RY.	202·47	187·28	188·51	201·66	215·25	245·35	327·74	283·65	252·48	249·53
B. B. C. I. RY.	54·74	56·49	55·90	58·58	63·87	67·72	77·99	69·05	71·53	82·44
TOTALS	646·50	668·80	696·60	792·68	721·69	836·03	1076·07	939·36	973·46	988·93
	OPEN MILEAGE OF STATE RAILWAYS									
	69	69	204	581	822	934	1292	2168	2414	2927

N.B.—The Oudh-Rohilkhand and South Indian Railways are excluded from this table because their mileage was increased between 1871 and 1880. The open mileage of the other Guaranteed Lines remained constant during these 10 Years. The traffic in the years 1874 and 1877 was abnormally large owing to the Famines in Bengal and Madras.



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THOS. D. BONA, Supdt.

INTRODUCTION.

Present Report includes Guaranteed Railways as well as State Railways—Revenue Accounts taken as the basis of statistics—Open line reviewed to 31st December 1880—Lines under construction or survey reviewed to 31st March 1881—Synopsis of Report—Territorial classification of Railways adopted—Productive, Protective, and Provincial Railways—Table of Railways in India—Heads of Railway Departments.

THE last Administration Report on Indian Railways* described the construction and working of the State lines from their commencement to the end of 1879. The present Report takes up the history of these State lines for the year 1880; but in order that the Railways in India may be dealt with as a whole system and not in isolated sections, the Guaranteed lines are also reviewed in this Report.

* Administration Report on Indian State Railways, by Major-General J. S. Trevor, R.E., Director General of Railways: Calcutta, 1881.

Present Report includes Guaranteed Railways as well as State Railways.

As in last year's Administration Report, the half-yearly Revenue Accounts have been taken throughout as the basis for all figures. These returns are made up for the calendar year; and although they may not be always strictly correct, after-adjustments having sometimes to be made in subsequent Accounts, they are readily accessible to all Railway Officers, and furnish statistics quite accurate enough for all practical purposes. The working of Railways open to traffic is reviewed, therefore, to the 31st December 1880. For lines under construction or survey later information is available; and these are dealt with up to the 31st March 1881.

Revenue Accounts taken as the basis of statistics.

Open line reviewed to 31st December 1880.

Lines under construction or survey reviewed to 31st March 1881.

Chapter I deals generally with Railway subjects. Chapter II gives a précis of the leading events that have occurred on Railways from the 1st January 1880 to the 31st March 1881. These events are alluded to more fully in Chapters III and IV, according as the circumstances relate to lines under construction or to Railways open for traffic. The subjects of the remaining Chapters are explained by the headings.

Synopsis of Report.

Statistics and Maps will be found at the end of the Report. Diagrams illustrating the traffic of Railways are placed at the commencement.

For convenience of reference, the Railways have been grouped territorially. Those in the left-hand upper corner of the Map of India are first treated of; then, working gradually down to the east and south, the others follow in succession. The Guaranteed lines have been classed together in a similar territorial order. The East Indian Railway, having come under the terms of a new contract, is kept separate.

Territorial classification of Railways adopted.

In the course of this Report the terms "Productive," "Protective," and "Provincial" will be found applied to Railway undertakings.

Productive, Protective, and Provincial Railways.

By a "Productive" work is meant, so far as Railways are concerned, an undertaking which can be estimated to pay, "within a maximum limit of five "years from the date of the line being opened for traffic, 4 per cent. on the "capital invested, including therein all arrears of simple interest incurred up "to that date, and also the capitalised value of the land revenue and of leave "allowances and pensions." Such a work may be constructed out of borrowed money.

Secretary of State's despatch No. 1 of 1881 (Financial).

By a "Protective" work is to be understood an undertaking not "necessarily "directly remunerative, but obviously protective in the sense of guarding "against a probable future outlay in the "relief of the population." Such a work may not be made out of borrowed money. The capital required for its construction must come out of the revenues of the country.

Secretary of State's despatch No. 62 of 1879.

A "Provincial" work is one that is undertaken by a Local Government which guarantees interest upon all capital advanced, whether that capital has been obtained from the Government of India, from provincial funds, or from local sources.

Table of Railways in India.

Heads of Railway Departments.

An interesting table giving the length of all the Railways in India constructed, in progress, and under survey on 1st January 1881, together with the names of the Officers who have served as Heads of Departments on each line during the year 1880, will be found in Appendix A. The list follows the territorial order above alluded to. The same succession will be adhered to throughout this Report, except in the statistical tables at the end of the work, which are classed into broad and narrow gauge.

RAILWAYS IN INDIA.

ADMINISTRATION REPORT.

CHAPTER I.

GENERAL REMARKS.

Mileage of Railways in India and in England—Financial results of Railway working in England and in India—Annual receipts of State and Guaranteed Railways—State Railways are not so productive as Guaranteed Railways, because they run through less productive country; are not yet fully developed as to traffic or staff; and are unfavorably placed as regards labor and fuel—Explanation of diagrams—The year 1880 is remarkable for the development of State Railways; the introduction of private enterprise; the Railway Conference—Works in hand on 31st March 1881—History of the gauge in India—Indian coal worked in Bengal and in the Central Provinces and that found in Madras, Assam, and the Punjab—Competition of English coal in the Indian market—Employment of natives as foremen mechanics and engine-drivers—Railway schools—Education of Native and Eurasian children—State Railway Provident Institutions—Messrs. Cook and Son's arrangements for tourists in India—Effects of wind pressure upon Railway structures—Table showing cost, financial results, &c., of Railways in India to 31st December 1880.

ON the 1st January 1881, the total length of Railway lines open to traffic in India was 9,325 miles.* The magnitude of this system can best be appreciated by comparing it with the total mileage of Railways open for traffic in England and Wales. On the 31st December 1879, this amounted to 12,547 miles.†

Mileage of Railways in India and in England.

	Miles.
* State lines	2,931¾
Native States	296¾
East Indian Railway	1,504¼
Guaranteed lines	4,592¼
Total ...	9,325

† General Report to the Board of Trade of the Railway Companies of the United Kingdom for 1879.

The following comparison of the financial results of Railway working in England and in India shows very favorably for the capital raised for the construction of Railways in this country :—

Financial results of Railway working in England and in India.

	Rs.
‡ State Railway Capital ...	*a*29,34,32,494
Guaranteed „ „ ...	*b*72,67,86,991
East Indian „ „ ...	*c*34,27,13,224
Total ...	1,36,29,32,709
Net receipts ...	6,37,53,002

Percentage proportion of net receipts to total share and loan capital for the Railways in the United Kingdom in 1879 ... 3·95†

Percentage proportion of net receipts to total capital outlay on State Railways and to total capital raised for other Railways in India in 1880 ... ... 4·68‡

Of these net receipts, the State Railways§ have contributed one-ninth, the Guaranteed and East Indian Railways eight-ninths: § the open mileage of State Railways being about 3,000 miles, and that of the Guaranteed and East Indian Railways about 6,000 miles.

Annual receipts of State and Guaranteed Railways.

	Net profits of year. Rs.
§ State Railways	61,33,947
Guaranteed and East Indian Railways	5,77,20,811

a This differs from the figures given in the table, pages 11 and 12, because it includes suspense items, &c.
b This differs from the figures given in the table, pages 11 and 12, because it includes the total capital raised.
c Differs from figures given in the table, pages 11 and 12, because it includes steam-boat expenses and earnings.

But it must be steadily borne in mind that in thus contrasting the financial results of State Railways with those of the old Guaranteed lines, great caution must be exercised; for a mere review of the corresponding statistics on the lines so compared would often lead to fallacious conclusions. So different are the proportions of traffic receipts to working expenses on different Railways, that rates which would yield a handsome profit on, say, the East Indian Railway—a line favored by cheap coal, easy gradients, and a nearly equal up and down traffic—would probably be unremunerative on State lines like the Punjab Northern or the Indus Valley Railway, where coal is dear, and the traffic all one way.

State Railways are not so productive as Guaranteed Railways,

In drawing any parallels of this sort, then, apparent anomalies may be sometimes explained by a consideration of the following points.

(*a*) The main thoroughfares and best openings for traffic have been already occupied by the Guaranteed Railways, and these have consequently a greater chance of financial success than the State Railways, some of which have been constructed for purely political or military reasons.

because they run through less productive country;

(*b*) The State lines are still in their infancy; they have not yet had time to consolidate or settle down to their working so as to obtain the best possible results, nor has the traffic as yet been fully developed. A retrospect of the old established lines in the earlier stages of their management will show that they, too, were many years before a fair traffic was developed or satisfactory results obtained.*

are not yet fully developed as to traffic

(*c*) The rapid increase of State lines has rendered it a matter of difficulty to get together and train a thoroughly efficient staff for their working. The difficulty of obtaining men from England is considerable, and those who are drawn from that source have much to learn to suit their practice to the altered conditions of this country. Also, the number of men with railway experience to be obtained in this country is not large, and only a small percentage of them are found desirable as permanent employés; consequently it is found that on the opening of any new line the staff has practically to be taught the duties required.

or staff;

(*d*) Many of the State lines are unfavorably placed as regards fuel and cost of labor; and the traffic offering is as yet fitful and very unequally balanced as regards the proportion of up to down traffic. On the East Indian Railway, for example, coal costs less than Rs. 3 a ton; on the Punjab Northern it is over Rs. 30 a ton; and the average daily wages of native workmen in the Upper Punjab and Sind are 82 per cent. higher than in Lower Bengal.

and are unfavorably placed as regards labor and fuel.

---

* The following comparison of the percentage of working expenses to earnings on some of the principal Guaranteed Railways will illustrate this:—

Railway Company.	Percentage of expenses to gross earnings in				
	2nd year of opening.	1865.	1870.	1875.	1880.
East Indian	51·96	44·82	43·68	39·58	32·98
Eastern Bengal	48·43	48·98	55·69	62·16	42·85
Sind, Punjab and Delhi	78·30	82·18	76·16	64·08	52·47
Great Indian Peninsula	60·81	59·54	62·25	47·27	55·49
Bombay, Baroda and Central India	54·91	63·83	60·54	54·41	42·56

The figures from which these percentages are worked out are taken from the tables, pages 11 and 12. Steam-boat earnings and expenses have been excluded, so as to show the results of railway working alone.

Such are some of the varying factors that must be eliminated before drawing any hard-and-fast contrast between lines constructed in a country like India, the different parts of which vary so strikingly in almost all their conditions; and even when the problem has been thus cleared, it must be remembered that the life of the younger Railways has not been prolonged enough to enable their present financial results to give even a tangible guide as to what their future prospects will be, or to supply a basis from which a comparison with the older established Railways can be usefully instituted.

Explanation of diagrams.

The three diagrams at the commencement of this Report are intended to illustrate some of the above remarks as regards the difference of traffic on the Railways in India. Diagram No. 1 shows the main centres of railway traffic which, it will be seen, are tapped by the Guaranteed lines; diagram No. 2, the distribution of that traffic along the lines, or the sections of line; diagram No. 3 marks the mileage of State Railways as it has yearly increased for the last ten years, and the corresponding development of traffic on the Guaranteed lines, to which these feeder lines have brought increased traffic.

The year 1880 is remarkable

The year under review is so far remarkable in the history of Railways in India as being connected with three important events. It has seen an unprecedentedly rapid and successful development of State Railways; it has witnessed the introduction of "private enterprise" into railway construction; it marks the date of the Railway Conference.

for the development of State Railways;

Between the 1st January 1880 and the 1st January 1881, 838 miles* of Railway have been opened for traffic,

			Miles.	Miles.
State	Punjab Northern	...	122¾	
	Punjab Northern, Salt Branch	...	54	
	Kandahar	...	152	
	Cawnpore-Farukhabad	...	49¼	
	Dildarnagar-Ghazipur	...	12	
	Rajputana	...	168	
	Holkar and Sindia-Neemuch	...	82¾	
	Nagpur-Chhattisgarh	...	53	
				693¾
Native States.	Bhavnagar-Gondal	...	105	
	Gaekwar of Baroda's	...	17½	
				122½
Guaranteed,	South Indian	...		21¼
			Total	838

and 232 additional miles † were opened by the 31st March 1881;

State	Miran Serai to Farukhabad	...	36¾	
	Neemuch to Chittor	...	34¾	
	Dowhali junction to Tirora	...	12½	
				84
Native States.	Goa Gate to Vishwamintri	...	1¾	
	Dhola to Dhoraji	...	89	
	Bangalore to Channapatna	...	35	
	Channapatna to Mandia	...	23	
				148¾
			Total	232¾

72 miles ‡ on the Punjab Northern were opened a few days after the close of the official year: making a total of 1,142 miles opened in about fifteen months.

Opened on 1st April 1881—			
Turnaul to Langar	...	...	58¼
Opened on 5th April 1881—			5
Haji Shah to Attock	...	...	...
Langar to Khushalgarh	...	...	8¾
		Total	72

With the exception of 21¼ miles on the South Indian Railway, the whole of this was constructed by State agency.

the introduction of private enterprise;

The scheme for developing the rapid extension of Railways in India by enlisting private enterprise in their construction differs from the old guarantee system, which was condemned by Lord Lawrence and Lord Mayo, in giving the shareholders of any Railway undertaking more direct responsibility in the economical construction and working of the line, by providing

that if the concern should prove to be a financial failure, the loss should, to a certain extent, fall upon those shareholders themselves. Under the old system the shareholders were so well secured by the Government guarantee as to have little practical interest in economical management.

The main lines of the policy on which private enterprise is now being enlisted were enunciated by the Hon'ble Major Baring in his Budget Statement for the year 1881-82. This new departure in the era of railway construction in India has received the approval of the Secretary of State; and the Marquis of Hartington, in a recent despatch (No. 1 of 1881, Financial) draws attention to the importance,

> in the case of Railways, * * * of ensuring their construction, whenever possible, by private capital, either local or European. It is true that up to the present time no Companies have been found willing to undertake the construction of Railways without a Government guarantee; but * * when any reasonable prospect of success presents itself, an endeavour should be made to encourage the raising of capital through private agency on the exclusive security of the success of the undertaking. * *
>
> * * * *
>
> In the event of its becoming apparent that the due execution of this policy is impracticable, it may become desirable to consider whether a modified system of guarantee might not advantageously be adopted. By a modified system, I mean one so restricted in respect to time and to the rate of interest guaranteed as to give subscribers a real interest in the efficient and economical administration of the Railway.

In the case of the Calcutta-Jessore Railway, the construction of which has been undertaken by the Bengal Central Railway Company, the duration of the Government guarantee of 4 per cent. is limited to five years,* and it is provided that the money so advanced is to be repaid from half the net earnings of the undertaking in excess of 5 per cent. on the paid-up capital. Government reserves to itself the right of purchasing the undertaking on favorable terms after thirty years.

* The full text of the agreement is given in Appendix C.

It is understood that this Railway Company was started under the auspices of the Messrs. Rothschilds and Messrs. Barings—two firms of world-wide financial repute—and this fact has no doubt given a stimulus to private enterprise as regards Indian Railways; it is hoped, however, that in future negotiations it may be found practicable to eliminate the question of any Government guarantee altogether, and to limit the State aid to grants of Government land or mining rights, or other similar liberal concessions. But the subject of railway construction by private enterprise is, however, still beset with difficulties. Capitalists in England have become so accustomed to consider a Government guarantee on Indian investments as a *sine quâ non*, that it is difficult to float an undertaking without State aid given in that form.

the Railway Conference.

The third of the leading events during the year was the assembling in Calcutta of the Railway Conference.

So far back as September 1876, it had been decided that, in order to facilitate the economic and efficient working of the Railways in India, a Railway Conference should be held, at which delegates of Guaranteed and State lines should take part, and frame such general rules as would form a basis towards mutual working, and so simplify their own daily routine, and offer to the public additional advantages. But the extreme pressure brought on the several Railway Administrations by the famines of 1876-77 and 1877-78, and the political aspect of affairs in 1878-79, rendered impossible the withdrawal of Railway officers from their duties during those years; and the general Conference originally proposed had twice to be postponed. A minor Conference, however, met on the 10th February 1879 to discuss certain pressing questions, the settlement of which could not well bear delay, chiefly regarding the interchange of rolling stock between connected Railways.

The rules for this interchange of rolling stock, as they stood, entailed considerable inconvenience to the public, and in times of brisk traffic were the cause of much friction between the Companies. Certain rules were therefore passed by this Conference of 1879 ensuring, if carried out according to the spirit of the intention, a free and unrestricted interchange of stock between all broad gauge lines at all seasons of the year; and arrangements were made for the compilation of a new set of general Rules and Regulations, which would be required under one of the clauses of the new Railway Act (which came into law afterwards as Act IV of 1879), and which should be applicable to the working of all the lines of Railway in India. The establishment of Provident Funds for the staff employed on Railways as well as the technical and industrial education of the children of Railway employés were also discussed. And lastly, the draft Railway Bill was read, clause by clause, and various suggestions noted for the consideration of the Select Committee to which that Bill had been referred.

This minor Conference was dissolved after holding six meetings. A draft Code of Rules for Indian Railways having been shortly afterwards circulated to all Railway Administrations, the Government of India proposed to hold a general Conference of delegates from the Guaranteed and State Railways in the following cold weather. This Conference met at Calcutta on the 6th January 1880, and was attended by delegates from every Guaranteed Railway, and by a sufficient number from State lines. The following important business was transacted:—

(1) A Code of general Rules for all Indian Railways was framed under Section 8 of the Indian Railway Act of 1879. This Code, with some slight modifications, received the sanction of the Governor General in Council, with effect from the 1st October 1880; and as far as can be gathered from a few months' experience, its rules appear to work smoothly.

(2) A general system for recording shunting and other miscellaneous locomotive service was passed, and has been generally adopted, by which the train and engine mileage given in the half-yearly accounts are based on the same principles for all lines.

(3) Difficulty having been experienced as regards the interchange of stock in working Rule XVII passed by the Conference of 1879, an amendment of that rule was passed.

(4) A Resolution was recorded pointing out the desirability of a revision and alteration of the present form of railway statistics. (A Committee, composed of Guaranteed and State Railway officers, subsequently appointed by Government, as suggested, took this matter into special consideration; and it is trusted that their recommendations, the whole of which were practically adopted by Government, will lead to a large diminution of labor in the compilation of useful statistics of railway working.)

(5) It was recommended that, when continuous brakes are introduced into Indian Railways, one and the same system should be adopted on all the lines, in order that vehicles belonging to the different Railways might continue to be easily interchangeable and run through from end to end of the several trunk routes, thus avoiding the inconvenience, insecurity, and expense at present found on English Railways owing to the many different kinds of continuous brakes that are in use on lines running in connection with one another.

(6) The introduction was effected of one standard maund of 82·29 lbs. on all Railways as the basis of weight; and the practices in dealing with minimum weights, charges and distances, fractions of weight and money, were all assimilated.

(7) Discussions took place also as to—

the adoption of a uniform goods classification for all India;
the extension to Guaranteed Companies of Government pensions and of the State Railway Provident Fund Rules;
the establishment of a central Railway clearing house; and
the incidence of charges for carriage of revenue stores.

And on the 13th January 1880 the Railway Conference was dissolved.

A full report of the proceedings of these two Railway Conferences is given in Appendix D.

Works in hand on 31st March 1881.

The chief works in hand on the 31st March 1881 were as follows :—

	Miles.	Remarks.
PUNJAB AND SIND.		
Punjab Northern—		
Bridge at Attock	2	Will be opened in 1883.
Attock to Peshawar	42	May be opened at end of 1881.
Turnaul to Khushalgarh	67	Opened on 1st and 5th April 1881.
NORTH-WESTERN PROVINCES.		
Muttra-Achneyra	22¾	Will be opened on 1st Nov. 1881.
Sindia—		
Chambal Bridge	8¾	Opened on 15th May 1881.
BOMBAY AND CENTRAL INDIA.		
Malwa line	101¼	Will be opened at end of 1881.
CENTRAL PROVINCES.		
Nagpur and Chhattisgarh—		
Tumsar to Amgaon	28	Opened in April 1881.
BENGAL.		
Tirhoot Railway—		
Muzaffarpur to Bettiah	75	
Darbhanga to Pipra Ghat	28	
CALCUTTA AND SOUTH-EASTERN RAILWAY.		
Sonapur to Magra Hat	15	
NATIVE STATES.		
Bhopal to Itarsi	62	
Mysore to Mandya	28	
Jodhpur	17	
EAST INDIAN RAILWAY.		
Hooghly Bridge and approaches ...	4	
Bhadreswar Branch	2	
GUARANTEED RAILWAYS.		
Bombay, Baroda and Central India—		
Godhra Extension	17	
Oudh and Rohilkhand Railway—		
Benares Bridge	5¾	

History of the gauge in India.

In no country has the question of gauge been more stoutly contested than in India. A précis of the most important correspondence on this subject has been prepared, and will be found in Chapter IV. It is full of interest, the narrative being traced back to 1841, when Sir Macdonald Stephenson first drew public attention to the importance of making Railways in India.

The leading facts are briefly these. When Railways were first started in India it was considered that a gauge wider than the English gauge (4′ 8½″) was desirable in this country. Lord Dalhousie recommended a gauge of 6 feet; but after much discussion the Court of Directors in 1851 ordered the adoption of a gauge of 5 feet 6 inches. This has since been known as the standard gauge for India.

In 1869 Lord Lawrence recommended a large extension of Railways throughout India, to be carried out year by year according to a well-considered plan. This was viewed with favor by the Secretary of State (Duke of Argyll); and the project was taken up with vigor by Lord Mayo, who had, in the meantime, succeeded Lord Lawrence. The wide extension of Railways was looked upon as a necessity towards the development of the resources of India; but the financial state of the country demanded some cheaper system than the 5 per cent. guarantee that had hitherto been given to semi-private Railway Companies. Moreover, it was observed that the requirements of many of the districts into which it was proposed to extend railway communication would be amply served by lines of less capacity than those hitherto adopted. Thus it came about that the Government of India decided in future to make its own Railways, either on the standard gauge or on a narrower one, according as the lines were trunk lines or lines of secondary importance.

Following out this plan, it was decided that the Railways intended for the Western and North-Western Frontiers of India would, if constructed on a narrow gauge, amply serve commercial and political demands. That is to say, a line from Kurrachee to Lahore and from Lahore to Peshawar on the metre gauge would give railway communication throughout that part of India, which would cope with all commercial demands, and would render all the assistance to the movements of troops that could reasonably be desired. This was assented to by the Secretary of State. The policy therefore was to construct the Indus Valley Railway between Kotri and Mooltan on the metre gauge, and either to lay a third rail between Kotri and Kurrachee and between Mooltan and Lahore, or else to reduce the gauge of those sections of the open line belonging to the Guaranteed Company—the Sind, Punjab and Delhi Railway. The line northward from Lahore towards Peshawar would be also on the metre gauge, and the whole line from Kurrachee through Lahore to Peshawar would be stocked with a sufficiency of locomotive and rolling stock to comply with all traffic demands. Such a system of lines would only present to the existing trunk lines of railway one break of gauge at Lahore; and it was considered that this drawback would make no sensible delay in military operations on the frontier. Lord Napier, the Commander-in-Chief in India, however, was in favor of the broad gauge on the Indus Valley, and only consented to the metre gauge on the Peshawar line as being preferable to having no Railway at all.

This decision to have these frontier lines on the metre gauge was come to in 1871, and the works on the Indus Valley and Punjab Northern Railways were started on that gauge. Very strong opposition was, however, shown to these orders in England, and persistent representations were made to the India Office, to the effect that little saving would result from the adoption of the narrower gauge. To this opposition the Duke of Argyll deferred, and in 1873 allowed the question to be reopened. Lord Northbrook and his Council then recommended that both of these lines should be made on the 5′ 6″ gauge, with a rail of 60 lbs. to the yard, basing their arguments on the military and political aspects of the case. Early in 1874 the Duke of Argyll replied that he still considered that lines on the metre gauge would serve every purpose required in that part of India, but gave way to the arguments of the military authorities, and consented to the broad gauge with a light rail of 45 lbs. to the yard. But this compromise was not accepted by the Government of India. The matter was then again considered by Lord Salisbury, who had meanwhile succeeded the Duke of Argyll at the India Office; and in June 1874 he decided, on military and political grounds, to make these lines on the broad gauge and with a rail of 60 lbs. to the yard.

As regards the system of Railways through Central India and Rajputana, with the exception of the short line between Agra and Gwalior, they have all been made on the metre gauge. The Government of Bombay and the inhabitants of Bombay have throughout strongly advocated that the gauge of the line from Ahmedabad northward towards Ajmere should be broad, on the ground that, as Delhi is nearer to Bombay than it is to Calcutta, Bombay

is the natural outlet for all Delhi produce, and that consequently the line between Bombay and Delhi *viâ* Ahmedabad and Ajmere should be a trunk line of railway. Several memorials on the subject were sent both to the Secretary of State and to the Viceroy. The metre gauge, however, was eventually decided on, and the line has since been completed on that gauge.

The gauge of the Sindhia Railway between Agra and Gwalior was settled on military and political grounds. It was a short line, with no immediate prospect of extension; and it was considered that it could be more usefully worked as a branch of the East Indian Railway if made on the broad gauge. Also, Maharaja Sindhia, who largely provided the money for its construction, was very desirous of having the line built on the broad gauge. It has therefore been constructed on the 5′ 6″ gauge.

Thus stands at present the question of the gauge in India. The opening this year of the Rajputana line will give valuable experience as to the sufficiency of a metre gauge Railway as a trunk line of communication. Of course, it is yet much too early to make comparisons, but the experience gained during the first half of 1881 would show that the cost of haulage from Delhi to Calcutta is likely to be much less than from Delhi to Bombay. In the half-year in question the proportion was as 1·045 to 2·045.

Indian coal

Few subjects perhaps occupy more attention in the working of a Railway than the consideration as to the fuel that is to be consumed.

worked in Bengal and in the Central Provinces

Coal of good quality for locomotive purposes is systematically worked in the Bengal coal-fields, which extend for about a hundred miles to the west of Burdwan. Collieries exist also at Warora and Mohpani in the Central Provinces. Coal is also found in the Punjab Salt Range, at Betul in the Central Provinces, and in the eastern districts of Hyderabad; but in none of these districts is it worked to any appreciable extent. A very valuable coal-field is known to exist at Makum in Upper Assam; and this will doubtless be opened out when the Assam Light Railways Company is fairly started. The total output of Indian coal in 1880 was 1,016,040* tons, of which by far the greater amount was raised in the Raneegunj coal-field. Owing therefore to its partial distribution and to the few places where it is as yet worked, the Railways of the Punjab and Madras have to import their coal from long distances, and consequently at a high cost. Coal which is worth Rs. 3 a ton delivered into wagons at Giridi, Bengal, costs Rs. 30 a ton by the time that it reaches Lahore.† Madras finds it cheaper to use patent fuel imported from England than to depend upon Indian coal. The total quantity of English coal imported into India during the year was 683,768 tons‡ (coke and patent fuel included), valued at Rs. 1,23,98,552.

and that found in Madras, Assam, and the Punjab.

* Review of the Maritime Trade of British India for 1880-81, page 32.

† Giridi to Lahore, 1,117 miles.

Competition of English coal in the Indian market.

‡ Review of the Maritime Trade of India for 1880-81, page 32.

Employment of natives as foremen mechanics

The question of training natives for employment on the Railways and in the Public Works Department continues to receive the attentive consideration of Government, and steps have been taken for establishing schools in which they can qualify for the position of foreman mechanic. In Bengal a school has been started in connection with the Calcutta Engineering College. In the North-West Provinces a similar school has been commenced. In Bombay the Government has instituted classes for the same purpose in connection with the Poona Civil Engineering College; and Native schools of industry have been established at Dhulia, Dharwar, Ratnagiri, and Surat. In Madras the Government considers that provision already exists for the preliminary instruction of Native youths, and adopts a system of apprenticeship at the workshops whereby a training is given before boys attain the position of foreman mechanic.

The employment of natives as engine-drivers is also receiving attention; and while there is still hesitation on the part of some Railway Managers to leave in their hands the driving of passenger trains, or even goods trains on the main lines, they are employed more than they were on branch lines and as shunters. On the East Indian Railway no less than 106 drivers and 117 shunters are natives; and Mr. D. W. Campbell, the Locomotive Superintendent, reports that they continue to give satisfaction. In order to extend the movement, and to qualify natives still more for the duties, 18 departmental schools have been established in connection with this Railway, and the average daily attendance at these schools is about 400. Mr. Campbell in his last report states, with just pride:—

and engine-drivers.

> It is now six years since the scheme, against strong opposing opinions and many existing difficulties, was launched; and although it has not yet attained the full extent of usefulness and economy to which it is capable of being expanded, the results are not only most satisfactory in a monetary point of view, but also most encouraging in what has already been accomplished, affording strong incentives for the continuance of the watchful fostering care which has been bestowed on it by the several officers of the Locomotive Department, to whose personal exertions these satisfactory results are entirely due.

It appears that since April 1875 there has been a saving of 16 lakhs of rupees in wages alone through the introduction of native drivers and shunters. On the Oudh and Rohilkhand Railway, also owing to the interest taken in the matter by the late Locomotive Superintendent, Mr. Cooke, there are 55 native drivers, who are employed in connection with the goods traffic and in shunting, and large numbers are in training. With the view of keeping alive an interest on the subject, as well as of producing practical results, the Government of India has required an annual report to be furnished by the different Railway Administrations of the progress made in training during each year. Additional information regarding the employment of natives as engine-drivers will be found in Appendix G.

Some advance, although not a considerable one, has been made with respect to providing the means of education on the hills for the children of Europeans and Eurasians employed on the Railways. As regards the East Indian Railway, the Company and the Government have agreed on the necessity for taking measures to supply the deficiency, which every year becomes of more pressing importance; and it is under consideration to devote certain sums of money which have accumulated from the fines levied on the men, from savings banks profits, and other sources to the purchase and adaptation of a building at Mussoorie, which is considered to be in a suitable situation for a school. This, however, will not accommodate all that need a sound elementary education in a healthy and temperate climate, and other measures are under consideration for extending the means of instruction to all the children.

Railway schools.

Education of Native and Eurasian children.

The Great Indian Peninsula Railway are desirous to join with the Government in forming a school for the benefit of the children of their servants at Pachmarhi, a hill station at an elevation of 3,500 feet, 27 miles from Piparia, about 100 miles west of Jubbulpore. The climate is described as salubrious, and suitable for the training of European children. The proposal is to supply accommodation for about 60 boys; and the Directors have expressed their readiness to provide a similar arrangement for the girls. Schools which have been established at Igatpuri and Bhosawal on that line of Railway are working very well. At the Bombay Scottish Orphanage arrangements have been made which will provide for the education of 15 orphans of the Railway servants.

On the Madras line schools have been established at Jollarpet and Pothanore, where from 80 to 100 pupils are received. The latter does not appear to have been working satisfactorily, and the numbers decreased from 50 to 28 in the course of the year.

In the Punjab good work still continues to be done in the infant school started by the Sind, Punjab and Delhi Railway at Mussoorie ; and this success seems in a large measure due to the personal interest taken in it by Mrs. Ross, the wife of the Traffic Manager. But the numbers are limited, and a more extended plan for the systematic education of the European children connected with the Punjab appears to be called for.

The following extract from the Proceedings of the Government of India in the Home Department (Education), No. 8, dated Simla, the 8th October 1881, is also of interest as regards schools, and shows how far Government is prepared to assist the several Guaranteed Railway Companies towards the education of the children of their servants :—

As regards free schools and orphanages, the foregoing arrangements seem to provide all that is immediately required in the way of building accommodation. For their more efficient maintenance, reliance must be placed upon the contributions of private charity and upon the Government grants-in-aid, the latter being so regulated as to give equally proportioned assistance to all classes of institutions in accordance with the amount of educational work done by each, and without any reference to denominational distinctions. Railway Companies and all other employers of European labour may very properly be called upon to aid in the support of institutions of this class.

To meet the case of Europeans above the indigent class, but whose means are still inadequate to meet the whole cost of giving their children a suitable education, what appears to be mainly required is (1) the provision of increased facilities for sending their children to boarding schools, either in the hills or on the plains, as they may themselves prefer ; (2) the improvement of the instruction given in existing station schools ; and (3) the establishment of schools in all stations now destitute of such instructions where the permanent European population is sufficiently numerous to warrant this.

As regards hill schools, the Governor General in Council is himself disposed to attach great value to the effect of a hill residence on growing youths of European descent ; but he does not think that the Government of India ought at present either itself to provide additional school accommodation in the hills, or to specially subsidise hill as opposed to plains schools. There are many vacancies in the existing hill schools of Lower Bengal, Assam, and the North-Western Provinces ; and when these are filled up, the extension of existing institutions will always be better and cheaper than the establishment of new schools. In most cases the Managers may be expected themselves to undertake such extensions. The Railway Companies have also done a good deal, and are prepared to do more, in the way of providing schools in the hills for the children of their European employés. It is only in the Central Provinces and the Punjab that new hill schools seem to be at present somewhat urgently required. In the former province the want will probably be met by the establishment of a Railway school at Pachmarhi ; and if this is made generally available to the European public, the Governor General in Council will favorably consider the question of assisting it by a building grant. In the Punjab what is required is an extension of the Lawrence Asylum at Murree to receive the children of men employed on the Punjab Northern State Railway, the Sind, Punjab and Delhi Railway, and the Indus Valley Railway,—of subordinates in the public service, and of other European parents who must use Indian schools. This matter should receive early attention from the Government of the Punjab. Apart from these special cases, the Government of India believes that the existing provision of hill schools is sufficient for all immediate wants.

Increased facilities for making use of these schools will be given by the revised system of Government grants-in-aid and scholarships, to be described hereafter, and also by the introduction on both the State and Guaranteed Railways of a system of free passes for children going to and returning from school when the parent stands in need of this aid. The Public Works Department will be requested to arrange the details of such a system. The Governor General in Council has no doubt that the Railway Administrations will gladly consent to meet the wishes of Government in this respect, as they have already shown themselves fully alive to the importanee of placing the means of education within the reach of the poorer classes of Europeans in this country.

State Railway Provident Institutions.

The State Railway Provident Institution was established, with effect from the 1st January 1880, "for the encouragement of savings by public servants employed on State Railways open to public traffic." One of these is established on every State Railway, and offers inducements to all the staff to practise thrift, and to make some provision for a future time. All employés entering the service after 1st January 1880 have to subscribe—the rates for married employés being 1 anna per rupee, for unmarried ½ anna per rupee, and voluntary deposits are also solicited. Government gives the same rate of interest on all deposits as it allows

in the State Savings Banks; and also, as an inducement to the employé to take an interest in the economical working of his Railway, it engages to give him an annual bonus, limited by the extent of his compulsory deposits, and dependent on the amount of the net profits made by the Railway. If those net profits exceed 4 per cent. on the capital cost, one per cent. of such profits is set aside for distribution as a bonus in proportion to the compulsory deposits; if the net profits are less than 4 per cent., then only one-half per cent. is given as the bonus.

The following table shows the number of depositors and the sums at their credit on the 31st March 1881:—

State Railway.	Number of staff depositing.	No. of Depositors.*		Amount at credit on the 31st March 1881.			
		Voluntary.	Compulsory.	Voluntary.	Compulsory.	Bonus.	Total.
				Rs.	Rs.	Rs.	Rs.
Punjab Northern	458	7	725	273	9,933	1,501	11,707
Indus Valley	1,112	110	1,031	48,208	19,928	5,708	73,844
Cawnpore and Farukhabad ...		Fund not opened till end of year.					
Muttra-Hathras							
Rajputana	767	104	723	33,492	19,174	†2,818	55,484
Holkar and Sindia-Neemuch ...	335	49	327	3,654	8,826	1,660	14,140
Tirhoot ...	236	76	231	4,627	6,542	3,327	14,496
Patna-Gya							
Nalhati	11	7	13	651	27	*Nil*	678
Northern Bengal	...	24	351	7,966	8,438	2,624	19,028
Nizam's		Fund not opened till end of year.					
Nagpur and Chhattisgarh ...	...	6	99	264	1,636	106	2,006
Wardha Coal	...	2	59	438	947	81	1,466
Rangoon and Irrawaddy Valley ...	273	51	247	9,340	7,402	‡864	17,606
Dhond and Manmad		Account closed.					

The total contributions from State Railway revenues for the year 1880 aggregated Rs. 22,670. The difference between this figure and the total bonus shown in the above statement is due to withdrawals and to the interest allowed by the Civil Department under Savings Banks Rules.

The establishment of these Provident Institutions will enable State Railway Administrations to bring within narrow limits the number of State Railway employés entitled to pension, and possibly to abolish altogether the grant of Government pensions to this class of public servants.

Messrs. Cook and Son's arrangements for tourists in India.

A novel feature in Indian railway working was offered this year by negotiation being opened with the Government by Messrs. Cook and Son, the well-known organisers of tourist arrangements, for the conveyance of travellers in India by their agency. Suitable terms are being settled, and Messrs. Cook and Son have established an agency at Bombay.

Effects of wind pressure upon railway structures.

The disaster of the Tay Bridge led to the appointment of a Committee to inquire into the question of wind pressure on railway structures. The report published by the Commission is extremely interesting, and extracts from it will be found in Appendix E.

In Chapter VIII will be found summarised particulars as to the details of construction of the Railways in India; such as the alignment, the junctions

* Any compulsory depositor also making voluntary deposits is counted under both heads.
† Bonus of Rs. 1,827 for second half of 1880 not included, having been credited in April 1881.
‡ Bonus of Rs. 628 due but not credited before April 1881.

with other lines, the date of commencement and opening, the weight of rails, the length of road, and whether the way is single or double, the number of stations, and so forth. The following table gives the capital outlay and the general results of the working of these Railways for the year 1880. In order to obtain the results of railway working, pure and simple, steam-boat earnings and expenses have been excluded from these figures. Similar information for preceding years is afforded in Chapter IX, where will be found tabulated the working results of all Railways in India from their commencement up to the end of 1880.

Statement showing the mileage, age, cost, and general results of working of Railways in India for the year 1880.

Gauge.	RAILWAYS.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on capital cost of: Gross earnings.	Working expenses.	Net profits.	Gross earnings per mile per week.
	STATE RAILWAYS.				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.
	Punjab and Sind.												
5′ 6″ / 3′ 3½″	Punjab Northern ...	224·75	180·12	2·78	4,04,37,319	1,79,921	33,68,284	28,04,113	5,64,171	8·33	6·93	1·40	360
5′ 6″	Indus Valley and Kandahar.	653·00	594·18	1·96	6,92,82,608	1,06,099	64,72,659	45,38,397	19,34,262	9·34	6·55	2·79	209
	North-Western Provinces Provincial.												
3′ 3½″	Muttra-Hathras ...	29·00	29·00	5·29	10,88,160	$7,523	1,35,226	77,556	57,670	12·43	7·13	5·30	89
3′ 3½″	Cawnpore and Farukhabad.	49·25	2·29	0·05	27,08,089	54,987	2,202	5,134	—2,932	0·08	0·19	—0·11	18
5′ 6″	Dildarnagar-Ghazipur	12·00	2·89	0·24	5,63,207	46,941	8,351	10,717	—2,366	1·48	1·90	—0·42	56
	Bengal Provincial.												
5′ 6″	Calcutta and South-Eastern.	28·00	28·00	18·36	66,30,843	2,37,137	1,42,698	1,01,344	40,754	2·14	1·53	0·61	98
4′ 0″	Nalhati ...	27·25	27·25	17·03	3,25,210	11,934	69,925	73,653	—3,728	21·50	22·65	—1·15	49
3′ 3½″ / 5′ 6″	Northern Bengal ...	243·50	243·50	3·03	1,96,73,726	80,796	14,49,206	8,54,386	5,94,910	7·36	4·34	3·02	114
3′ 3½″ / 5′ 6″	Tirhoot ...	85·00	85·00	4·55	51,51,330	62,821	4,52,924	2,62,199	1,90,725	8·79	5·09	3·70	102
5′ 6″	Patna-Gya ...	57·00	57·90	1·64	82,20,951	56,598	4,81,556	2,70,300	2,11,256	14·95	8·39	6·56	162
	Bombay and Central India.												
3′ 3½″ / 5′ 6″	Rajputana ...	499·50	470·30	5·52	3,40,61,947	69,585	37,23,719	24,90,414	12,33,305	10·93	7·31	3·62	152
3′ 3½″	Western Rajputana...	82·63	82·63	1·13	63,17,255	76,452	6,50,103	5,57,724	92,379	10·29	8·83	1·46	151
3′ 3½″	Holkar and Sindia Neemuch.	254·50	227·71	3·22	2,53,37,858	99,559	14,01,250	10,47,263	3,53,991	5·53	4·13	1·40	118
5′ 6″	Sindia ...	66·50	66·50	2·15	81,51,903	1,22,585	2,01,824	1,77,714	24,110	2·48	2·18	0·30	58
5′ 6″	Dhond and Manmad	145·75	145·75	2·74	1,04,58,463	71,756	6,95,094	6,06,875	88,219	6·65	5·80	0·85	91
	Central Provinces.												
5′ 6″	Wardha Coal ...	46·50	46·50	4·66	56,15,804	1,20,769	1,55,900	2,38,376	—82,476	2·78	4·25	—1·47	65
3′ 3½″	Nagpur and Chhattisgarh.	53·00	39·21	0·74	30,37,689	57,315	1,08,952	82,681	2,127	3·42	2·72	0·70	54
	Burma Provincial.												
3′ 3½″	Rangoon and Irrawaddy Valley.	161·00	161·00	3·67	1,23,07,244	76,443	13,22,710	8,01,626	5,21,084	10·74	6·51	4·23	158
	Native States.												
2′ 6″	Gaekwar of Baroda's	57·75	49·07	3·37	11,44,210	19,813	1,28,824	63,687	65,137	11·26	5·57	5·69	51
5′ 6″	*Berars* Khamgaon	8·00	8·00	10·33	5,08,187	63,523	27,363	23,106	4,257	5·38	4·55	0·83	98
5′ 6″	*Branches.* Amraoti	6·00	6·00	9·87	4,34,261	72,377	50,865	47,226	3,639	11·71	10·87	0·84	163
5′ 6″	Nizam's ...	121·00	121·00	6·23	1,20,62,228	99,688	7,02,716	4,78,407	2,24,309	5·83	3·97	1·86	112
...	Bhavnagar-Gondal*	...	...	...	...	...	...	...	...	...	...	...	...
5′ 6″	EAST INDIAN RAILWAY.	1,504·25	1,504·25	17·73	33,03,98,294	2,19,643	4,29,14,430	1,41,53,658	2,87,60,772	12·99	4·28	8·71	549
	GUARANTEED RAILWAYS.												
5′ 6″	Sind, Punjab and Delhi	663·50	663·50	14·65	11,04,52,484	1,66,470	1,21,67,588	63,84,358	57,83,230	11·02	5·78	5·24	352
5′ 6″	Oudh and Rohilkhand	546·75	546·75	8·28	5,77,96,380	1,05,709	44,55,160	25,50,740	19,04,410	7·71	4·41	3·30	157
5′ 6″	Eastern Bengal ...	158·00	158·00	15·70	3,31,68,524	2,08,935	44,51,318	19,07,547	25,43,771	13·42	5·75	7·67	540
5′ 6″	Bombay, Baroda and Central India.	†444·00	444·00	14·94	8,28,42,480	1,86,582	82,44,375	35,08,452	47,35,923	9·95	4·23	5·72	355
5′ 6″	Great Indian Peninsula.	1,275·75	1,275·75	16·20	24,99,77,200	1,95,945	2,49,53,253	1,38,47,702	1,11,05,551	9·98	5·54	4·44	372
5′ 6″	Madras ...	858·00	858·00	16·78	11,03,55,385	1,29,202	61,62,545	42,05,409	19,57,136	5·56	3·79	1·77	138
3′ 3½″	South Indian ...	645·25	637·26	7·61	4,16,72,963	64,584	35,59,594	26,29,576	9,30,018	8·54	6·31	2·23	106
	Total and average ...	8,996·38	8,760·41	11·20	1,28,56,91,292	1,42,912	12,36,55,103	6,48,00,345	6,38,54,758	10·01	5·04	4·97	282

Note.—Steam-boat earnings and expenses have been excluded from the figures in this statement.

*105 miles opened on 20th December 1880; no returns yet available. | † Including Patri Branch.

CHAPTER II.

PRÉCIS OF LEADING EVENTS ON RAILWAYS IN INDIA DURING 1880-81.

STATE RAILWAYS.—*Punjab and Sind.*—Punjab Northern Railway—Extension of main line from Jhelum to the Indus; from the Indus to Peshawar—Pindi-Kohat Branch—Salt Branch—Indus Valley and Kandahar Railways worked by State agency—Rohri reclamation—Indus ferry—Ruk-Sibi line, also called Lower Section, Kandahar Railway—Upper Section, Kandahar Railway—Extension from Sibi to Pir Chauki—Details of construction of Lower Section, Kandahar Railway—Floods—Indus bridge at Sukkur—Crossing originally proposed—Crossing now proposed. *North-Western Provinces and Oudh.*—Muttra-Hathras Railway—Cawnpore-Farukhabad Railway; extension—Dildarnagar-Ghazipur Branch—Muttra-Achneyra Railway—Bhaupur-Kalpi Survey—Bareilly-Pilibhit Survey—Patna-Bahraich Survey—Bareilly-Ranibagh Railway; proposals to construct it by private enterprise. *Bengal.*—Successful working of Bengal Railways—Development of private enterprise—Bengal Central Railway Company—Calcutta and South-Eastern Railway; extension—Nalhati Railway—Northern Bengal Railway—Darjeeling Tramway—Northern Bengal Extension to Dinagepore—Tirhoot Railway; extensions from Muzaffarpur to Bettiah, from Darbhanga to Pipra Ghat, and from Muzaffarpur to Hajipur—Patna-Gya Railway—Dacca-Mymensingh Survey—Private enterprise on Palamow line and Chota Nagpore Railway—Darjeeling Tramway—Kaunia and Dhurla Tramway—Deoghar Steam Tramway. *Bombay and Central India.*—Rajputana Railway; opening on 1st January 1881—Rajputana-Malwa Railway System—Sindia-Neemuch Railway—Neemuch-Nasirabad Railway—Sindia Railway—Chambal Bridge—Bhopal, Gaekwar of Baroda's, and Bhavnagar-Gondal Railways—Patri Branch—Dhond-Manmad Railway—Eastern Deccan Railway—Surveys from Barsi Road to Pandharpur and Barsi Road to Barsi—Marmagao-Hubli Railway. *Central Provinces.*—Wardha Coal Railway—Nagpur and Chhattisgarh Railway. *Madras.*—Private enterprise—Projected line from Metapaliyam to Coonoor—Cochin and Travancore Railway Company—Bellary-Hospett Extension—Madura-Paumben Extension—Tinnevelly-Trevandrum project. *Burma.*—Rangoon and Irrawaddy Valley Railway—Rangoon and Sittang Valley Railway. *Assam.*—Private enterprise—Dibrugarh-Sadiya project—Garo Hills Survey. *Native States.*—Bhopal line—Bhavnagar-Gondal or Kathiawar Railway—Gaekwar of Baroda's Railway—Khamgaon and Amraoti Railways—The Nizam's Railway—Mysore Railway.

EAST INDIAN RAILWAY.—New contract; its terms—Hooghly Bridge—Doubling of line from Buxar to Mogul Serai.

GUARANTEED RAILWAYS.—*Punjab and Sind.*—Sind, Punjab and Delhi Railway; War traffic; Flotilla superseded by Indus Valley Railway. *North-Western Provinces and Oudh.*—Oudh and Rohilkhand Railway; Ganges Bridge at Benares; Flood damages. *Bengal.*—Eastern Bengal Railway. *Bombay and Central India.*—Great Indian Peninsula Railway—Bombay, Baroda and Central India Railway; Nerbudda Bridge; Godhra Extension. *Madras.*—Madras Railway; Cheyer Bridge—South Indian Railway.

STATE RAILWAYS.

PUNJAB AND SIND.

Punjab Northern Railway.

THE necessity for a line of communication between our forces in Northern Afghanistan and their base of operations in India caused strenuous efforts to be made to push on the Punjab Northern Railway in the direction of Peshawar. The difficulties to be overcome were great. The country traversed by the railway between Jhelum and Attock is rugged and hilly and deeply intersected by ravines; the streams to be crossed were formidable; labor was more scarce than ever, the sparse population of this part of the Punjab leaving their homes and preferring the high rates offered for work in connection with the military operations across the frontier. But the work was required to be done, and no money was stinted. Large gangs of men were collected and worked day and night, using the electric light during the hours of darkness; the Bakrala, Sohan, and other rivers* were bridged; by a liberal use of gradients of 1 in 50 diversions were made to turn the more formidable rock cuttings; and by the 1st January 1881 the Punjab Northern line was opened to the left bank‡ of the Indus, and a permanent railway

Extension of main line from Jhelum to the Indus;

* Bakrala Bridge	...	1 span of 80′, 4 spans „ 120′
Sohan	...	2 „ „ 80′, 5 „ „ 120′
† Sohawa	...	3 spans of 60′
Bishendor	...	3 „ „ 120′
Bykhan	...	2 „ „ 80′

‡ To Haji Shah. In April 1881 the line was extended to Attock itself.

ridge* was in progress over that river itself. A temporary bridge-of-boats was thrown across the Indus capable of carrying rails; and platelaying and bridging vigorously prosecuted on the section from Attock to Peshawar (42 miles). This section may be ready for traffic by the end of 1881.

* Described in Chapter III—
2 spans of 300 feet.
3 " " 250 "
Rail level 117 feet above level of river; piers of braced steel.

from the Indus to Peshawar.

Simultaneously with these operations, another line of railway was constructed running from Rawalpindi in the direction of Kohat, to form a support for the force in the Kuram Valley. This length of 67 miles from Turnaul to Khushalgarh was nearly completed up to the left bank of the Indus by the end of the official year, and was opened a few days† afterwards.

Pindi-Kohat Branch.

† On the 5th April 1881.

The Salt Branch line from Lala Musa to Miani, 54 miles, was also opened during the year, and at once developed a most flourishing traffic, the net receipts of which at the end of the official year gave 6·3 per cent. on the capital outlay.‡

Salt Branch.

		Rs.
‡ Capital outlay	...	19,34,627
Gross earnings	...	2,14,394
Working expenses	...	92,318

A project was considered for extending this line so as to reach the Salt Mines at Khewrah, from which the present terminus at Miani is distant 10 miles. But the large cost of bridging the Jhelum near Pind Dadan Khan would have so unduly swelled the capital outlay as to render a fair return on it as very problematical. This scheme is consequently held in abeyance, and an alternative project is being investigated for extending the line without crossing the river in the direction of Bhera and Shahpur, to catch a traffic in passengers and grain, which has unexpectedly showed itself where only a favorable salt trade was known to exist.

Indus Valley and Kandahar Railways worked by State agency.

The negotiations with the Sind, Punjab and Delhi Railway Company for working the Indus Valley Railway not having been concluded, the management of this latter line was conducted throughout the year by State agency. The road was improved during the year by ballasting, by providing additional waterway as a security against the spills of the Indus river, and by raising the banks. Additional quarters were constructed for housing the Railway staff; and a stone breakwater was built at Rohri, on the left bank of the Indus opposite Sukkur, extending from the bluff of Sateean along the cold weather bank of the river. It is hoped that this work will secure a fixed point at which pontoons can be established for at least eight months of the year, and that even during the remaining months the ferry traffic may be worked from very near this same point instead of being liable to be compelled to shift every flood season to the steps a mile lower down the left bank of the river. This stone bund will also reclaim a large extent of foreshore, where space is much required for sidings, &c., for the proper working of the Rohri Bunder station.

Rohri reclamation.

Indus ferry.

A most important extension was made to the main line of the Indus Valley Railway by the construction of a branch line from Ruk on the Indus Valley Railway. This branch was commenced in October 1879, and by the middle of January 1880 the rails were laid as far as Sibi (133 miles), and the line sufficiently completed to carry the whole of the war traffic occasioned by the extensive military operations in Southern Afghanistan. It was opened for general coaching traffic in May 1880, and for goods traffic two months afterwards. The thanks of the Government of India were conveyed to the officers engaged in the construction of the line in the following terms:—

Ruk-Sibi line.

"The Government of India has viewed with great satisfaction the remarkable progress that has been made in the prosecution of this important work. Platelaying was commenced at Ruk, the junction of the Sukkur-Quetta Railway with the Indus Valley Railway, on 5th October 1879, and the line was brought into Sibi on 14th January 1880, a length of

133½ miles having been laid in 101 days. The rate of progress is unprecedented in the annals of Indian railways; and when it is considered that at the time the work was commenced there was little permanent-way material in Sind, that all the rest had to be drawn from the various broad gauge lines in India, and that most of this material had to be carried through about 100 miles of country devoid of water, there are perhaps few, if any, other instances in the world where rail-laying has been pushed along with such rapidity against such impediments."

also called Lower Section, Kandahar Railway.

This branch from Ruk to Sibi was originally known as the Lower Section of the Kandahar Railway, taking off from the Indus Valley Railway at Ruk station. It runs through Shikarpur and Jacobabad and crosses the Kachi desert; and in order to establish a secure line of communication between India and our forces in Southern Afghanistan, proposals had been made to prolong it towards Kandahar itself, the section north of Sibi being styled the Upper Section of the Kandahar Railway.

Upper Section, Kandahar Railway.

Preliminary reconnaissances had been made as to the best road to Kandahar; and a railway up the Bolan pass, not requiring special gradients and special stock, having been found impracticable, an alternative route was surveyed running up the valleys of the Nari and Harnai streams, past Sharigh and the Chappar rift to Gulistan Karez; and thence, crossing the Khoja Amran range near the Gwaja pass, to Kandahar. A branch was also surveyed from Kasim Kila to Quetta.

The country traversed by the line was found to present numerous difficulties, and in the case of the Chappar rift a serious obstacle presented itself; but none of these difficulties were insurmountable, and the greater part of the line between the Chappar rift and Sibi having been staked out, the work of construction was begun in January 1880, the working parties treading close on the heels of the surveyors. By the end of that month engines were running from Sibi to Nari gorge, 7 miles; the earthworks too were vigorously prosecuted in the Nari and Harnai valleys, and platelaying commenced; quarters were built for the Railway staff, and defensible posts constructed at convenient distances to afford protection to the gangs of workmen; preparations were also made for the heavy tunnelling operations in the Chappar rift, at each end of which depôts of tools and of dynamite were formed,—connection being established between these depôts by a cart-road through the rift itself.

The reverse to our arms at Maiwand, however, necessitated the withdrawal of the garrisons from the defensible posts in the Harnai valley; the Railway staff was at the same time withdrawn, and the line being thus left unprotected, the Marri tribes raided the works, and all work was absolutely stopped. After the retaking of Kandahar, work along the Lower Section was again started in November; but soon after the Government of India issued orders to stop the railway works at Nari gorge, 7¼ miles north of Sibi. The railway works, however, were so far complete as to furnish a fairly broad road as far as Quetta, partly bridged, along which a cart could be driven.

Extension from Sibi to Pir Chauki.

Besides the work thus prosecuted in the Upper and Lower Sections of the Kandahar Railway, a short branch line, 19 miles long, with temporary bridges over the Nari and Kumri rivers, was completed from Sibi to Pir Chauki at the mouth of the Bolan pass. It was opened for military traffic in October 1880.

Details of construction of Lower Section, Kandahar Railway.

The Ruk-Sibi line, or Lower Section of the Kandahar Railway, presented no engineering difficulties; but the country traversed by it being an absolutely barren and waterless desert for more than 90 miles, elaborate arrangements had to be made for the supply of water and food to the large gangs of workmen employed in its construction. Inconvenience and expense in the maintenance and working of the line have since arisen from the same cause. The time of year, too, at which the line was opened was an extremely trying one, not only because of the heat, which is intense in these districts, but also on account of the floods from the spills of the river Indus, which, breaching a point above the Kusmore bund, reached as far as the Railway and damaged it in several places,

Floods.

The most serious of these floods occurred on the 27th June 1880 between the stations Nuttall and Bellput. It carried away so much of the road, that through communication was not restored until late in July, at the very time when our defeat at Maiwand was bringing the most severe stress on the line, owing to the reinforcements that were being hurried up to the front.

Troops of all arms, stores, and transport animals were, however, safely conveyed over this almost waterless tract under the burning sun of August; and at the close of the war the special thanks of Government were accorded to the officials of this and the other Punjab lines.

The saving of human life and suffering effected by the Railway in transporting the troops across the Kachi desert can hardly be overestimated. It is extremely doubtful if reinforcements could have been pushed over this tract at that time of year without its assistance. In any case, the aid afforded by the line can best be gauged perhaps by bearing in mind that one single railway train did do, with comparative ease, in one day of 16 hours what it would have taken 2,500 camels to do in a fortnight.*

* Assuming a camel to carry 5 maunds 10 miles a day, the duty of 1 camel = 50 maund miles.

A railway train of thirty-five 10-ton wagons can travel 200 miles in 24 hours, thus performing $35 \times 10 \times 28 \times 200$, or, say, 20,00,000 maund miles per day.

Much has been done during the year to consolidate the roadway and bridge the line, and large tanks were excavated at the desert stations to pond up the flood water. The rough accommodation, too, which was at first hastily improvised to give shelter to the Railway staff has been improved.

The line was visited in November 1880 by His Excellency the Marquis of Ripon on his way from Mooltan to Kurrachee.

Indus bridge at Sukkur.

The ferry arrangements over the Indus at Sukkur, referred to further on, admirably conducted as they were, can at best be considered only as a makeshift. Even for ordinary traffic, the inconvenience due to the break is considerable, and the present arrangements, expensive as they are, are quite insufficient to cope with any rush of traffic; and on a line like the Indus Valley Railway, constructed mainly for military and political purposes, the absence of a bridge over the Indus at Sukkur incontestably constitutes a weak link in the chain of communication. It becomes an open question, too, whether the capitalised cost of these ferry arrangements, taken together with other indirect charges, such as the demurrage that must accrue on rolling stock crossing the river, would not pay for the construction of the bridge itself.

Crossing originally proposed.

The site of the crossing is one of the most striking scenes in India. The Indus river, after flowing through an alluvial plain for several hundred miles, suddenly meets at Sukkur with a range of limestone. It is evident that this range once formed an obstacle which for centuries withstood the force of the current and turned off the waters of the mighty river southwards into the Runn of Kutch. Eventually, probably owing to some convulsion of nature, two rifts were formed in the rock, and through these two gaps the Indus has ever since poured its volume. Between these two rifts rises steeply the island of Bukkur in the middle of the stream; and the most obvious site for a bridge appears at first sight to be the point where the channel is of least width between this intermediate island and the banks of the river itself. Several designs have at various times been submitted for spanning these two rifts. The channel on the right, or Sukkur, bank presents no extraordinary difficulty. But on the left, or Rohri side, the river pours down in flood time with irresistible force and with great depth of water; and it was considered necessary to cross this channel with one single span.

Designs for a suspension bridge were therefore prepared; but the cost of it proved to be so great, that the Consulting Engineer for State Railways prepared a bold and novel design of a braced steel arch with a span of 750 feet and a rise of 150 feet. Through the haunches of this arch the railway would pass,

the roadway being suspended from the arch above. This design was approved generally by the Government of India and the Secretary of State; but in discussing the exact site of the crossing, it was deemed advisable to make further investigations as regarded the foundations for the abutments. This was done during the year; and the result is not encouraging, as it is now known that the bed of the river and the banks on either side near the proposed crossing were not so stable as was at first thought. The river just above the proposed site of the bridge may be described as passing over a submerged waterfall, the crest of which is of a horse-shoe form, and is about 20 feet below low-water. The pit at the foot of this crest is 80 or 100 feet deep; and it is not ascertained whether the bottom is rock even at that depth, or whether, if it is rock, it would afford a safe foundation; for the recent investigations led to the discovery that clay bands occur intermingled with the rock, and the action of the water having washed out the clay from these bands, huge masses of limestone rock have been undermined and have fallen in, and there is now no doubt that submerged blocks, which were previously considered to be solid rock, are really only detached masses which have fallen in this manner. Further, there is a probability that this action is still going on in other parts, and that the bands of clay which may exist at a lower level are being gradually eroded by the water.

Crossing now proposed.

With such uncertainty as regards the foundations, and with the known difficulties to be faced in the erection of such an arched bridge over such a river, it was considered advisable to allow the project to stand over. Moreover, the money required for such a scheme was very large, and it was felt that for the present that money could be laid out to better advantage on railways in other parts of the empire. The single span project has therefore been abandoned; and it has now been proposed to move the bridge further down-stream, where the channel is wider, the rush of water less, and the foundations more assured.

It has been estimated that a girder bridge might be constructed below Sukkur, with eight spans of 240 feet each, for about 27 lakhs of rupees; and surveys have been directed to ascertain whether any unforeseen difficulty exists.

Desirable as would be the construction of this missing link in the through communication of the Indus Valley Railway both in a commercial and in a military point of view, the large outlay involved renders it necessary to consider whether, with the present limited means at the disposal of Government, such a sum of money would best be laid out at present in this manner, or whether it would not be more profitably applied in extending more generally the means of railway communication throughout India. It has hitherto been considered that the Indus at Sukkur could only be bridged by a bridge of special design; the present proposal is to cross the river with a bridge similar to that spanning the Sutlej at Adamwahan. The cost of such a bridge can be calculated fairly approximately; so if the foundations are reported good, it is trusted that the construction may be ordered to be commenced at once.

NORTH-WESTERN PROVINCES AND OUDH.

Muttra-Hathras Railway.

The Muttra-Hathras Railway continues to show increased prosperity and to earn a fair return on the capital expended. Detailed figures will be found in Chapter III.

Cawnpore-Farukhabad Railway;

On the Cawnpore-Farukhabad Railway the following sections were opened for traffic during the year:—

	Miles.	Date of opening.
Cawnpore to Meran Serai	49¼	15th December 1880
Meran Serai to Farukhabad	36¾	1st February 1881

The line was opened too late in the year to permit of its financial prospects being analysed; but, so far, these are encouraging.

extension.

An extension of this line, 102 miles in length, has been surveyed. The alignment runs from Farukhabad *viâ* Kaimganj and Khasganj to Hathras

Road, and will connect the Cawnpore-Farukhabad Railway with the Muttra-Hathras line, and thus complete the through communication from Cawnpore to Muttra. This extension, on the completion of the Muttra-Achneyra Railway and on the construction of a bridge over the Jumna at Muttra, will provide a complete provincial system on the metre gauge, joining at Achneyra the Rajputana Railway, to which it will be a valuable feeder.

Dildarnagar-Ghazipur Branch.

The Dildarnagar-Ghazipur Railway is a branch line, 12 miles in length, which connects the Ganges at Tari Ghat, opposite Ghazipur, with the East Indian Railway at Dildarnagar. It was opened for traffic on the 5th October 1880, and has since been worked by the East Indian Railway under an arrangement entered into between the Government and that Company, by the terms of which the East Indian Railway finds rolling stock and maintains and works the line, taking two-fifths of the net receipts as its share of the profits.

Muttra-Achneyra Railway.

The Muttra-Achneyra Railway, 22¾ miles in length, is approaching completion. It joins the Rajputana Railway at Achneyra, and when finished is to be worked by that Railway, pending the construction of the Jumna bridge at Muttra and of the Cawnpore-Farukhabad Extension *viâ* Khasganj, when it will form a through line on the metre gauge from Achneyra to Cawnpore.

Bhaupur-Kalpi Survey.

Besides the Cawnpore-Farukhabad Extension, a survey has been made between Bhaupur and Kalpi for a broad gauge line.

Bareilly-Pilibhit Survey.

Another survey has been run from Bareilly to Pilibhit, in continuation of a through line from Jaunpur *viâ* Partabgarh, Rai Bareli, Lucknow, Sitapur, and Gola Goharnath towards Bareilly.

Patna-Bahraich Survey.

Arrangements were also made for a survey up the Gogra Gunduck doab, to connect the north bank of the Ganges opposite Patna with the Nepalese frontier north of Bahraich *viâ* Gorakhpur, Basti, and Gonda.

Bareilly-Ranibagh Railway; proposals to construct it by private enterprise.

Negotiations are in progress with a private company for the construction of a light railway from Bareilly to the foot of the Himalaya at Ranibagh, 61 miles. Part of the proposed line runs through an unproductive country; but its projectors expect to reap good results from the traffic to Naini Tal and the surrounding hill stations. If the line is carried out, the Government will get its mails, troops, and stores carried more expeditiously and satisfactorily than at present, and the district of Kumaun would derive great advantages.

BENGAL.

The following statement shows the length of lines in Bengal, Guaranteed and State, under survey or construction, or open for traffic, during the year 1880-81:—

Gauge.	Railway.	Open for traffic during any part of the year.	Under construction.	Under survey or not commenced.	Remarks.
5′ 6″	East Indian*	1,504½	...	4	State; leased to a Company.
5′ 6″	Eastern Bengal	153¾	...	...	Guaranteed.
5′ 6″	Calcutta and South-Eastern	28	15	13½	State.
4′ 0″	Nalhati	27½	...	...	,,
Metre	Northern Bengal	243½	...	73	,,
Metre	Tirhoot	85	103	65	,,
5′ 6″	Patna-Gya	57	...	80	,,
5′ 6″	Bengal Central	...	...	245	Private enterprise.
Metre	Dacca and Mymensingh	...	...	128	State.
2′ 2″	Darjeeling Tramway	† 40	10	...	Private enterprise.
2′ 6″	Kaunia and Dhurla Tramway	...	21	14	State.
Metre	Deoghar Tramway	...	...	6¾	Private enterprise.
	East Indian ...	1,504½	...	4	
	Guaranteed ...	153¾	...	...	
	State ...	481	149	625½	
	GRAND TOTAL ...	2,144	149	629½	

* Total mileage credited to Bengal (though the line runs partly through the North-Western Provinces), the East Indian Railway being under the administration of the Consulting Engineer to the Government of India for Guaranteed Railways, Calcutta.

† Whole length to Darjeeling since opened for traffic.

In Bengal the year has been one of prosperity and financial success; and the results of this year's working tend to prove that in rich and highly cultivated districts, such as Bengal, railways have only to be carefully managed to pay a handsome interest on the capital expended, even within a short time of their opening.

Successful working of Bengal Railways.

These favorable results have probably exercised their influence in stimulating the development of private enterprise, and a private Company has been floated in London for the construction of the Bengal Central Railway:—

Development of private enterprise.

	Miles.
From Ranaghat to Jessore and Kulna	82½
„ Bongong to Calcutta	47

The surveys for these lines and also for sections of the same system from Maimari to Ranaghat, and from Santipur to Bhagwangola, had been carried out by the State in late years. By the end of the financial year the negotiations between the promoters and the Secretary of State regarding the concessions to be given to this Company had been completed, the declaration for the land required had been published, and arrangements were in hand for the immediate commencement of the earthwork from Ranaghat to Bongong and from Dum-Dum to Baraset. These have since been completed. The first sod was turned on the 12th May 1881, and good progress has been made since.

Bengal Central Railway Company.

The Calcutta and South-Eastern Railway has been worked throughout the year by the State. The line is to be extended from Sonapur* to Diamond Harbour; and the section from Sonapur to Magra Hat is under construction. This branch will tap a rich rice-producing district, and its construction will probably bring a great increase to the traffic on the line.

Calcutta and South-Eastern Railway;

	Miles.
* Calcutta to Sonapur ...	10
Sonapur to Magra Hat ...	15
Magra Hat to Diamond Harbour ...	13¾

extension.

This line is under the same management as the Calcutta and South-Eastern Railway. The local depression of trade has led to the line being worked at a slight loss to the State.

Naihati Railway.

On the Northern Bengal Railway, on the other hand, the financial results have been highly satisfactory, the expenditure having been reduced to 56 per cent. of the earnings.†

Northern Bengal Railway.

	Rs.
† Earnings	16,34,588
Expenditure	9,25,145

The Darjeeling Tramway, which joins the Northern Bengal Railway at Siliguri, was opened to Sonada during the year and subsequently to Darjeeling; and through booking was introduced between the Eastern Bengal Railway, the Northern Bengal Railway, and the Darjeeling Tramway.

Darjeeling Tramway.

It has been proposed to construct a branch Railway from Parbatipur on the Northern Bengal Railway to Dinagepore,‡ in view of an eventual extension to the river Ganges at a point near Sahibgunge.

Northern Bengal Extension to Dinagepore.

‡ Parbatipur to Dinagepore ...	19

The financial success of the Tirhoot Railway is also most encouraging; the line having earned over 4 per cent. on the capital outlay.§ Extensions are under construction from Muzaffarpur to Bettiah, 75 miles, and from Darbhanga to Pipra Ghat, 28 miles; and these branches, passing as they do through a rich country, will, it is anticipated, bring increased traffic to the line, and open out the district generally.

Tirhoot Railway;

	Rs.
§ Capital outlay to 31st March 1881 ...	59,02,388
Net earnings	2,43,017

extensions from Muzaffarpur to Bettiah, from Darbhanga to Pipra Ghat,

A survey has been made of a line to connect the Tirhoot system with Patna, the trading capital of Behar, and to work in with another projected line running from Hajipur to Gorakhpur *vid* Sehwan and Chapra.

and from Muzaffarpur to Hajipur.

The Patna-Gya line has been worked very satisfactorily. Its working expenses during the year were 55 per cent. of the gross earnings, and it paid 6 per cent. on its capital outlay.*

Patna-Gya Railway.

	Rs.
* Capital outlay to 31st March 1881 ...	35,78,442
Net earnings	2,19,755

The Dacca-Mymensingh line is intended to connect those two towns with the Eastern Bengal Railway. The line was surveyed in 1879, and detailed estimates will now be made. Negotiations for the construction of this line have been opened with the promoters of the Bengal Central Railway Company.

Dacca-Mymensingh Survey.

Proposals have also been received from private companies to construct a line of railway from Palamow *vid* Daltongunge to Baroon on the Sone river, in order to open up the extensive coal-fields of Palamow; also for the construction of a railway from Barakar on the East Indian Railway towards the Nagpur and Chhattisgarh line. This latter line would reduce the distance from Calcutta to Bombay by some 240 miles, would open up the coal-fields of Chota Nagpore, and serve a rich agricultural district.

Private enterprise on Palamow line and Chota Nagpore Railway.

This completes the description of the Railways in Bengal. The Darjeeling Tramway has been only slightly touched upon, because it was not until after the end of this year that it became a railway in the legal sense of the word. It is now termed the Darjeeling Himalayan Railway.

Darjeeling Tramway.

Its lengths were opened as under:—

	Miles.	Date of opening.
Siliguri to Kurseong	30	23rd August 1880
Kurseong to Sonada	9½	1st February 1881
Sonada to Jore Bungalow	5½	24th March 1881

It has since been opened through to Darjeeling.

The Kaunia and Dhurla Tramway starts from the northern bank of the Teesta river opposite Kaunia, which is the terminal station of the Rangpur branch of the Northern Bengal Railway, and runs to Dhurla, 15 miles, on a 2′ 6″ gauge. The line is nearly completed.

Kaunia and Dhurla Tramway.

Proposals have also been made to construct a steam tramway from Baidyanath on the East Indian Railway to Deoghar, the site of an ancient Hindu shrine, to which crowds of devotees annually make pilgrimage.

Deoghar Steam Tramway.

BOMBAY AND CENTRAL INDIA.

The following table, showing the system of Railways in Bombay and Central India, is recapitulated for convenience of reference:—

Gauge.	Railway.	Total length open on 1st January 1881.	Under construction.	Under survey or not commenced.	Remarks.
		Miles.	Miles.	Miles.	
5′ 6″	Great Indian Peninsula ...	1,288	...	...	Guaranteed.
5′ 6″	Bombay, Baroda and Central India ...	421½	...	...	,,
3′ 3⅜″	Rajputana	716¼	...	...	State: made over to control of Bombay Government on 1st November 1880.
5′ 6″		1½			

Gauge.	Railway.	Total length open on 1st January 1881.	Under construction.	Under survey or not commenced.	Remarks.
		Miles.	Miles.	Miles.	
3′ 3⅜″	Malwa—				
	(*a*) Comprising Holkar and Sindia-Neemuch, including Ujjain Branch ...	254½	...	...	
	(*b*) Neemuch-Nasirabad ...	...	135¼*	...	* Neemuch to Chittor, 33¾ miles, opened on 10th March 1881.
5′ 6″	Sindia	66½†	8¼‡	100§	† Worked by East Indian Railway. ‡ Chambal bridge and approaches (since opened on 15th May 1881). § Gwalior to Mau-Ranipur.
5′ 6″	Bhopal	See *Native States.*			
2′ 6″	Gaekwar of Baroda's ...				
3′ 3⅜″	Bhavnagar-Gondal ...				
5′ 6″	Patri	22½	...	...	State: worked by Bombay, Baroda and Central India Railway.
5′ 6″	Dhond-Manmad ...	145¼	...	...	State: worked by Great Indian Peninsula Railway from November 1880.
...	Bombay Eastern Deccan...	...	...	173½	Provincial.
5′ 6″	Barsi Road to Pandharpur	...	...	33	Proposed branches from Great Indian Peninsula Railway.
5′ 6″	Barsi Road to Barsi ...	...	...	20½	
...	Marmagao-Hubli ...	...	...	124	

The two Guaranteed lines are dealt with subsequently.

During the year the intermediate work between the Rajputana Railway and the Western Rajputana line was completed; and on the 1st January 1881 these two Railways were amalgamated under the title of the Rajputana Railway,* and the whole line was opened for traffic by His Excellency the Governor of Bombay. A means of through communication between Bombay and Delhi† was thus established, which shortens the road to Northern India by 344 miles, and which in all probability will become the principal thoroughfare for traffic moving from Bombay in this direction.

Rajputana Railway;

	Miles.	Date of opening.
* Raipur to Sujat Road	24	20th Oct. 1880
Sujat Road to Pahlanpur	144	1st Jan. 1881

† Bombay to Delhi—	Miles.
Rajputana route *vid* Ahmedabad ...	889½
Great Indian Peninsula route *vid* Allahabad	1,234
Difference ...	344½

opening on 1st January 1881.

The bridges which were unfinished at the date of opening were completed by the 1st May 1881.

Traffic.—During the year 1881 on the amalgamated undertaking the gross earnings were—

			Rs.	Rs.
Rajputana Railway	...	...	37,23,719	
Western Rajputana Railway	...	...	6,50,103	
				43,73,822
The expenses were—				
Rajputana Railway	...	...	24,90,414	
Western Rajputana Railway	...	...	5,57,724	
				30,48,138
		The profits were		13,25,684

being at the rate of 3·28 per cent. on capital expended.* Some discussion has arisen on the subject of the loss of traffic on the part of the Great Indian Peninsula Railway, due to the opening of the new route. Before long, however, this Company will feel the benefit of the opening of the Malwa line.

	Rs.
* Rajputana Railway ...	3,40,61,947
Western Rajputana Railway	63,17,255
	4,03,79,202

Rajputana-Malwa Railway System.

The Holkar Railway, Sindia-Neemuch Railway, and the Neemuch-Nasirabad Railway are continuations of one and the same line ; and as soon as they are linked in with the Rajputana line, they will all form one system, and will be known as the Rajputana-Malwa Railway System.

Sindia-Neemuch Railway.

On the Sindia-Neemuch Railway 73 miles were opened during the year.†

	Miles.	Date of opening.
† Rutlam to Jaora ...	20¾	25th Feb. 1880
Jaora to Mandsaur...	31½	8th Apl. „
Mandsaur to Neemuch	30½	2nd July „
	73¾	

Neemuch-Nasirabad Railway.

On the northern portion between Neemuch and Nasirabad, a length of 33¾ miles‡ was so far completed before the end of the year as to allow of its being opened for traffic; leaving an intermediate link still to be completed between Nasirabad and Chittor of 100 miles in length.

	Miles.	Date of opening.
‡ Chittor to Neemuch	33¾	10th March 1881

Platelaying has been since vigorously pushed on both from the Chittor and the Nasirabad ends; and it is expected that the line will be opened throughout from Ajmere to Khandwa in November 1881, with diversions at some of the larger bridges, and that it will be completely bridged by the monsoon of 1882. When completed it will form a third alternative route between Bombay and Northern India, the distances between Bombay and Delhi by this route being 117 miles§ longer than by the Rajputana Railway.

	Miles.
§ Bombay to Delhi—	
Vid Khandwa and Ajmere ...	1,006½
Vid Ahmedabad and Ajmere ...	889½
Difference ...	117

Sindia Railway.

The Sindia Railway has hitherto been cut in half by the Chambal river. The section from Agra to the Chambal river, 34 miles, has been opened since 1878, and has been worked by the East Indian Railway since the end of 1879. Then comes the incomplete section of the Chambal bridge‖ and approaches, 8¼ miles. Work was vigorously pushed on here during the year, and both approaches and bridge were nearly completed by the end of the year. South of the Chambal is the Hetampur-Gwalior Section, 32½ miles, worked throughout the year by the Rajputana Railway management. After the opening of the Chambal bridge the whole Sindia line was made over to the East Indian Railway Company to be worked by it as an extension of its Agra branch. The Maharaja Sindia lent the British Government 75 lakhs in perpetuity at 4 per cent. for the construction of this line.

Chambal Bridge.

‖ 2 spans of 150 feet.
12 „ „ 200 „

Bhopal, Gaekwar of Baroda's, and Bhavnagar-Gondal Railways.

The Bhopal, Gaekwar of Baroda's, and Bhavnagar-Gondal Railways are treated under the head of *Railways in Native States.*

Patri Branch.

The branch from Viramgaum Junction on the Bombay, Baroda and Central India Railway to Patri in the Runn of Kutch continues to be worked by the Bombay, Baroda and Central India Railway Company. It was originally constructed by that Company at the expense of the State.

Dhond-Manmad Railway.

The object of the Dhond-Manmad Railway is to connect the railway system of Northern and Southern India by a short chord, and so obviate the necessity of descending and ascending the great barrier of the Western Ghats. The line was

put in hand for famine relief purposes in 1877, and was laid throughout before the rains of 1878. It was worked as a State line till December 1880, when the Great Indian Peninsula Railway Company took it over, agreeing to pay to Government 20 per cent. of the gross earnings when they amounted to 5 lakhs or less, and 1 per cent. per lakh earned beyond 5 lakhs; with a proviso that the Company will not be required to work the line at a less percentage rate than 10 per cent. in excess of the mean rate on their own line for the year.

The whole of the engines and rolling stock of the Dhond-Manmad line was transferred at the end of last year to the Punjab Northern and Indus Valley Railways, where it was urgently needed.

Eastern Deccan Railway.

The earthwork on this line was nearly completed in 1879 as a famine work as far as Bijapur. The line during this year has been finally surveyed and staked out from Bijapur to Bhagalkot. It is proposed that when constructed it shall be on the metre gauge.

Surveys from Barsi Road to Pandharpur and Barsi Road to Barsi.

Proposed branches from the Great Indian Peninsula Railway were surveyed from Barsi Road to Pandharpur, 33 miles, and from Barsi Road to the city of Barsi, 20½ miles.

Marmagao-Hubli Railway.

In December 1878 a Treaty of Commerce was concluded between England and Portugal providing for reciprocal freedom of commerce, navigation, and transit. Certain clauses were included relating to the construction of a railway from the Portuguese port of Marmagao to the Tinni Ghat on the frontier between English and Portuguese possessions in India, and thence on to Hubli and Bellary in British territory. This Bellary-Hubli Extension is intended to open up the Southern Mahratta Country, and a portion of the earthwork from Bellary to Hospett in the Madras Presidency was done as a famine relief work in 1877.

Under the recent Commercial Treaty between Portuguese and British India, the Indian Government agreed to allow any Company, formed under the guarantee of the Portuguese Government for constructing a railway inland from the port of Marmagao, certain concessions as to the extension of such a line into British India. A board of gentlemen, known as the Stafford House Committee, obtained a concession and guarantee from the Portuguese Government to construct such a line of railway, and forthwith placed themselves in communication with the Secretary of State for India with a view to extending the line to Hubli. Full surveys and estimates for a line of railway from Hubli to the port of Karwar had been made, and found too expensive at the time to compensate for the advantages to be derived; so consequently this project was held in abeyance. The distance from Hubli to the rival port Marmagao was known to be shorter, but no thorough survey and estimate of a line of railway connecting these two places had been made. The Secretary of State therefore agreed to give all assistance to the Company as regards the survey, and lent the services of several engineer officers to assist in the work. A favorable trace for the railway was found; and Lord Hartington, weighing the merits of the two schemes—Marmagao-Hubli and Karwar-Hubli—and giving due consideration to the stipulations of the Commercial Treaty, decided to favor the construction of the railway from Marmagao. Owing, however, to complications, which could not fail to arise, as to the control of a line in British India by a Company under the control of a foreign power, the Secretary of State has undertaken on behalf of the Indian Government to make arrangements for the extension of the Portuguese line on to Hubli and Bellary, upon being satisfied that the Portuguese section of the line is in a fair way of being completed, and that proper measures will be taken for rendering the port of Marmagao safe and suitable for the purposes of commerce.

CENTRAL PROVINCES.

During the year the two lines controlled by the Central Provinces Administration were the Wardha Coal Railway and the Nagpur and Chhattisgarh line.

Wardha Coal Railway.

The Wardha Coal Railway continued to be worked by Government. The net results of receipts and expenditure show a loss. This was due to the necessity that arose for closing the Colliery works for several months, owing to the breakdown of the machinery. The success of the Railway is mainly dependent upon the successful working of the Colliery; so that if the latter breaks down, the working of the former fails also. By the end of 1880 the machinery had been overhauled, and it is hoped that no further breakdown will occur.

Nagpur and Chhattisgarh Railway.

In April 1880, 53 miles of the Nagpur-Chhattisgarh Railway, from Nagpur to Tumsar, were opened for traffic.* Construction works have been pushed on, and by the end of the year a total of 88 miles of rails had been laid and linked in, with a temporary diversion across the Wain Ganga river.

* Opened in April 1881 to Amgaon, 81st mile.

Great difficulty was experienced in the tunnels at Duwakussa.

Extension surveys were carried out from Dongargarh to Raipur *vid* Nandgaon, and extended to Bilaspur. Subsequently the construction of the section thus surveyed between Dongargarh and Nandgaon was commenced.

When first the line was opened, traffic was not large, and it had to be suspended altogether when the rains set in, owing to the sinking of the banks where the line runs through black cotton soil; but later in the year both coaching and goods traffic developed considerably, and it may be reasonably anticipated that the line will very soon yield a good percentage on its capital outlay.

MADRAS.

In Madras no lines of railway have as yet been constructed by the agency of the State; the two existing lines, *viz.*, the Madras and the South Indian Railways, being both Guaranteed lines.

Private enterprise.

This year proposals have been made by private Companies for the construction of the two following branches from the Madras Railway:—

(1) From Metapaliyam to Coonoor.
(2) From Shoranur to Cochin.

Projected line from Metapaliyam to Coonoor.

The proposal for an extension of the Metapaliyam branch to the Nilgiri plateau was first mooted in 1875. It has now assumed a more definite character, a Company having been started in Madras to float the undertaking. It will probably be on the metre gauge; will have comparatively easy gradients from Metapaliyam to Kullar at the foot of the Nilgiri Hills, $5\frac{1}{2}$ miles, and from thence up the Coonoor Ghat, $6\frac{1}{2}$ miles, the gradients will be very heavy. The production of tea, coffee, and cinchona is steadily increasing on the Nilgiri hills, and it is anticipated that the traffic which will seek the line will at once give a fair return. The scale of tariffs on which these calculations rest is considerably higher than that on the Madras Railway.

In February 1881 permission was given to the Agents of the Company to open out the existing trace between Coonoor and Kullar to a width of 3 feet through Government waste land; but little work will be done until the Company asks for fewer and more reasonable concessions. The matter is still under consideration.

Cochin and Travancore Railway Company.

The second extension from Shoranur to Cochin, $59\frac{1}{4}$ miles, would connect the Madras Railway with the only good port on the west coast of the south of India. Surveys for this branch were made by the Madras Railway for this extension as far back as 1868. The Madras Government now proposes that a Company should be organised for the construction of this branch, with a guarantee of 4 per cent., and obtained from the Travancore and Cochin Governments a

deposit of Government paper to aid in the payment of the guarantee. The line when completed was to be worked and stocked by the Madras Railway.

The Government of India viewed the scheme favorably, but were unable to accept the proposed distribution of the guarantee; and the question as to the alignment of the Railway having been since reopened by Sir T. Madhava Rao, further information is awaited.

Bellary-Hospett Extension.

No further action has been taken regarding the construction of the Bellary-Hospett Extension in connection with the Marmagao-Hubli Railway.

Madura-Paumben Extension.

A length of 48 miles of the Madura-Paumben Extension have been surveyed, running from Madura along the existing road for 21 miles, and thence by Ramnad to Kilakari. The line has been designed as a protective work.

Tinnevelly-Trevandrum project.

The question also of the extension of the line of railway from Tinnevelly to Trevandrum has been raised, but the proposals for undertaking it have not yet assumed a definite form.

BURMA.

Rangoon and Irrawaddy Valley Railway.

In Burma the Rangoon and Irrawaddy Valley Railway was worked throughout the year with very satisfactory results, the net earnings being 4·47 on the capital expended.

The suburban lines in the vicinity of Rangoon, aggregating some 5⅔ miles, were finished during the year, and the development of traffic upon them even now justifies their construction.

Rangoon and Sittang Valley Railway.

Sanction has also been accorded to construct as a State railway on the metre gauge the "Rangoon-Toungoo Railway," or "Rangoon and Sittang Valley Line" as it is sometimes termed. It is believed that this line will soon be a paying one, and it is consequently classed as a productive public work, the financial responsibility for which rests with the Local Government.

The length of this line is 163 miles; and though it is primarily a military line, which will connect an exposed frontier garrison with our seaboard, it is calculated that it will also open up a land-locked country, at present thinly peopled it is true, but possessing indefinite capabilities of development.

Proposals were made at one time to carry out this line by private enterprise; but taking into consideration the facts that the Toungoo line is linked, and will be worked, with the Irrawaddy line, and that it will share the same workshops, the same supervising staff, and the same rolling stock as that Railway, it was considered undesirable to separate the two lines or place them under a separate management.

ASSAM.

Private enterprise.

In the latter part of 1879 a private Company was formed for the construction of a line of railway from Dibrugarh to Sadiya in the Upper Assam Valley.

Dibrugarh-Sadiya project.

This line is about 53 miles in length, and runs through a level, agricultural country, consisting chiefly of tea plantations. A branch, about 23 miles in length, to the Makum coal-field connects the main line at Dumduma, and should bring an immense supply of coal, valuable timber, and petroleum into the Indian market. Negotiations were nearly concluded at the end of the official year with the promoters of the undertaking.

Whilst these negotiations were in progress for the development of the Upper Assam Valley, proposals were also under the consideration of Government for the prolongation of the projected Dacca-Mymensingh line across the Garo Hills to Gauhati. Two routes have been suggested for the opening up of the Lower Assam Valley—the one crossing the Garo Hills, and the other passing round the foot of the hills and running along the banks of the Brahmaputra.

Garo Hills Survey.

The former of these appears to be preferable, as being more direct and opening up a valuable coal-field; and a reconnaissance of it has been ordered.

NATIVE STATES.

In Native States 122½ miles* were opened to traffic by the 1st January 1881, and 148¾ miles† more were opened by the 31st March.

	Miles.
* Bhavnagar-Gondal Railway ...	105
Gaekwar of Baroda's Railway ...	17½
	122½
† Bhavnagar-Gondal Railway ...	89
Gaekwar of Baroda's Railway ...	1¾
Mysore Railway ...	58
	148¾

The Bhopal line runs from Itarsi on the Great Indian Peninsula Railway to Bhopal.‡ The Government of India pays for that portion of the line running through British territory and for a moiety of the cost of the bridge over the Nerbudda, or in all about 12½ lakhs. The Begum of Bhopal gives 50 lakhs for the construction of the line through her dominions. Profits are to be shared between Her Highness the Begum and the British Government in proportion to their respective contributions towards capital cost. The line is being constructed on contract by Messrs. Glover and Company.

Bhopal line.

‡ Itarsi to Bhopal, 62 miles.

Work was commenced in November 1880, and satisfactory progress has been made. At the Nerbudda bridge the masonry of two piers had been begun and the foundations of other piers were well forward.

Extension surveys were run during the year from Bhopal to Jhansi, with a branch to Saugor.

The Bhavnagar-Gondal Railway is so called because it has been constructed from the revenues of those two States. It is sometimes termed the Kathiawar line. Commenced in 1879 as a famine work, it was completed this year as a fair weather line on the following dates:—

Bhavnagar-Gondal or Kathiawar Railway.

	Miles.	Date of opening.
Bhavnagar to Wadhwan ...	105	20th December 1880
Dhola to Dhoraji ...	89	19th January 1881

It was hoped that the whole of the bridging would have been completed before the rains of 1881, but unforeseen difficulties arose and traffic had to be stopped over a considerable portion of the line on the outburst of the monsoon. By the end of March 1881 the open line was covering its working expenses.§

§ From date of opening to 31st March 1881—

	Rs.
Earnings ...	1,31,008
Expenditure ...	1,03,094

Gaekwar of Baroda's Railway.

The Gaekwar of Baroda's 2′ 6″ gauge line was extended during the year as follows:—

	Miles.	Date of opening.
Dabhoi to Baroda ...	17½	1st July 1880
Goa gate to Vishwamintri ...	1¾	24th January 1881

The open line working continues to give satisfactory results, the net revenue showing a return of 7·31 per cent. on the capital expended; and the

Baroda State is contemplating an extension of these 2′ 6″ gauge lines from Anand to Pitland and Piploe, and from Meysana on the Rajputana Railway to Pattan and Kherala.

The success of the Baroda lines, as a substitute for roads in Guzerat, where, owing to the absence of stone, the construction and maintenance of roads are costly, has been so marked, that the Bombay Government is considering the expediency of making a line on this (2′ 6″) gauge from Jambusar to Broach, utilising the present road for the purpose.

Khamgaon and Amraoti Railways.

The Berars branches have been constructed from the surplus revenues of the Berars to facilitate the transport of cotton from the marts of Khamgaon and Amraoti. They were formerly worked by the Great Indian Peninsula Railway Company, and then by State agency from 1st January 1879. They have now (1st November 1880) been again made over to the Great Indian Peninsula Railway Company to be worked as an integral part of their undertaking.

The Nizam's Railway.

Up to the end of 1878 the Nizam's Railway was worked by the Great Indian Peninsula Railway Company. Since then it has been managed by State agency. The net earnings during the year were 1·8 per cent. on the capital outlay.

Mysore Railway.

The broad gauge line from Bangalore cantonments to Bangalore city (3 miles) was transferred in October 1880 to the Madras Railway Company as an integral portion of its guarantee.

Of the metre gauge line from Bangalore pettah to Mysore, 58 miles were opened for traffic during the official year, *viz.*,—

		Miles.	Date of opening.
Bangalore to Channapatna	...	35	1st February 1881
Channapatna to Mandya	...	23	20th March 1881

On the unopen line between Mandya and Mysore, 28 miles, rails are laid, line is ballasted, and engines run through, except over the Cauvery viaducts, where there is only a temporary wooden bridge. It is expected that the permanent bridge over the Cauvery will be ready by the 1st January 1882, and that the line will then be opened throughout.

EAST INDIAN RAILWAY.

On the 31st December 1879 the Secretary of State asserted his right under the purchase clause of the contract with the East Indian Railway Company, and purchased the East Indian Railway at the expiry of the first term of 25 years. But it was never the intention of the State to work the line itself; so arrangements were made by which the original Company should continue the working and management, and by which they would still hold a direct interest in its economical management. The new contract giving effect to these arrangements came into force on the 1st January 1880; and the purchase of the line was thus effected without any hitch in its working and without causing any alterations in its working staff.

New contract;

The purchase of the line was effected by the State accepting each original £100 share at a value of £125, and then converting them into terminable annuities. As, however, it was found that the original shares were largely held by trustees on behalf of different trusts, the option was given of accepting the annuity or of transferring the amount into East Indian 4 per cent. paper. This latter alternative was largely availed of.

its terms.

The principal provisions of this new contract are that the management of the line is to remain with the Company, the Government having full control over their proceedings. Regarding receipts and expenses,—after the ordinary working

expenses, the first charges on the general receipts are—(1) a sum not exceeding one lakh of rupees per annum for State control; (2) the interest on debenture stock; (3) payment of the annuity; (4) interest on new capital; (5) interest on the total value of stores in hand; (6) payments to the provident institution. Of the remainder, Government takes four-fifths and the Company one-fifth. This latter is their remuneration for working the line; but as it is only divided amongst those annuitants who hold the deferred annuities, its amount is very appreciable. Also all expenditure in the acquisition of land will in future be added to the capital account; and Government may require the Company to give running powers for the locomotive and rolling stock of State and Guaranteed lines, or to construct and work any branch railway in connection with the undertaking.

A copy of the new contract will be found *in extenso* in Appendix B.

Several important proposals were under the consideration of Government during the year for the construction of certain additional works for the development of traffic on the East Indian Railway.

Hooghly Bridge.

The most important work is the connection of the East Indian Railway with Calcutta by a bridge over the Hooghly river. This will be done by means of a short branch of about 4 miles to connect the East Indian and Eastern Bengal Railways, and crossing the river close to the town of Hooghly. The bridge will ensure many advantages, both of a local and general character, and will doubtless lead to the development of the traffic on these two lines. The estimated cost of the bridge is 20 lakhs; and as this project involves the doubling of the Eastern Bengal Railway from Ranaghat to Sealdah, a considerable sum must be spent before the whole work is complete.

Doubling of line from Buxar to Mogul Serai.

Another proposal was that the line should be doubled from Buxar to Allahabad. There is no doubt but that the traffic over this section is very heavy; but as a certain amount of it originates on the Oudh and Rohilkhand Railway, it was considered that the opening of the bridge over the Ganges at Benares would afford relief for some time yet. It has therefore been thought sufficient in the first instance to confine the doubling to the section between Buxar and Mogul Serai, the junction for Benares, arranging that the laying of this portion should be finished by the time that the bridge, now being constructed at Benares by the Oudh and Rohilkhand Company, was approaching completion.

The third proposal was the insertion of an additional sleeper to each rail over 1,200 miles of line, and the gradual substitution of wrought iron for timber sleepers throughout the road. This is being carried out gradually.

The project of bridging the Hooghly was accepted by the Government of India and by the Secretary of State; and being one involving considerable engineering skill and resource, the Board of Directors of the Company considered it desirable to bring their talented Agent and Chief Engineer, Mr. Bradford Leslie, to England to elaborate the project in conference with their Consulting Engineer.

GUARANTEED RAILWAYS.

Fuller particulars regarding the traffic on these lines will be found in Chapter IV, and in the statistics attached to the Report.

PUNJAB AND SIND.

Sind, Punjab and Delhi Railway.

On the Sind, Punjab and Delhi Railway the main fact to be recorded is, that it carried successfully the heavy traffic in troops and material of war for the war in Afghanistan, and merited the thanks of the Government of India. No additional mileage was opened during the year. The length of line worked was 664 miles; and the capital expended was Rs. 11,05,85,552, being at the rate of Rs. 1,66,670 per

War traffic.

mile. The goods stock has received 600 additional wagons of 10 tons capacity, and many of the old 6-ton wagons were converted so as to carry 8 and 10 tons.

Several new stations were also opened during the year, and additional conveniences given to the travellers and traders in many ways, especially in local train services, by which the local traffic was considerably stimulated.

The increased waterway in the valleys of the Beas and the Beyne was completed, and happily no serious damage was done to the line by floods.

Flotilla superseded by Indus Valley Railway.

The opening of the Indus Valley Railway has practically superseded the utility of the Indus Steam Flotilla, and which, after doing valuable work for many years in completing the communication between Mooltan and Kotri, has consequently ceased to run. The vessels are now laid up and are awaiting purchasers.

NORTH-WESTERN PROVINCES AND OUDH.

Oudh and Rohilkhand Railway.

On the Oudh and Rohilkhand Railway the only additional mileage in progress during the year was contributed by the bridge over the Ganges at Benares and the approaches to it, aggregating in all about $5\frac{3}{4}$ miles. The bridge itself will probably be 3,518 feet in length from end to end of the girders, made up of seven spans of 356 feet and of nine spans of 114 feet.

Ganges Bridge at Benares.

Considerable progress was made in England during the year in preparing the plant necessary for the construction of the piers and in manufacturing the workshop machinery required for the works generally, and more especially for the erection of the girders. The earthwork of the approaches was commenced in June 1880 and was well advanced by the end of the year.

Flood damages.

In September 1880 heavy floods occurred in the valleys of the Ganges, Ram Ganga, and Gungun. They were caused by the same excessive rainfall that resulted in the fatal landslip at Naini Tal; the line was breached in several places, and the traffic for some time was seriously interfered with. By the end of March 1881, however, all repairs and new works were well in hand, and all diversions have since been removed.

BENGAL.

Eastern Bengal Railway.

In August 1879 the floods on the Brahmaputra and the Ganges were very high, and overflowed the Eastern Bengal line in several places, rising as high as the roadway at the site of some of the bridges. Though no serious damage was done, special works were sanctioned this year for protecting the line against a similar attack, and these have now nearly all been completed. This year the floods in these two rivers have not been so high, and have caused no serious damage to the road.

The erosion at Goalundo, however, has not ceased; but the river is still 700 yards distant from the line, and the cold weather stream is well away from the promontory.

BOMBAY AND CENTRAL INDIA.

Great Indian Peninsula Railway.

The working of the Dhond-Manmad chord line and of the Berars branches (Khamgaon and Amraoti), which had hitherto been conducted by State agency, was transferred during the year to the Great Indian Peninsula Railway Company. A summary of the terms on which the transfer was effected is given in Chapter III.

Progress was made with the Bori Bunder terminal station and offices; interlocking signal apparatus was provided between Poona and Lanauli; the site

for the stores depôt at Parel was taken over by the Company in exchange for the Byculla shops and stores, which were transferred to the Government; and the system of train working over the Ghat sections was fully discussed and some important alterations introduced. These are given in full at page .

Bombay, Baroda and Central India Railway.

On the Bombay, Baroda and Central India Railway the new bridge over the Nerbudda river was nearly completed by the close of the year.* Twenty-five spans of the old bridge were swept away by the floods of September 1876. The present structure was commenced in December 1877, and consists of twenty-five spans of 180 feet, the girders being supported by piers formed of two iron cylinders. The depth of foundation varies from 55 to 104 feet, and the height of the underside of the truss above low water is 51 feet. The disaster to the Tay Bridge in 1879 has led to some additions being made to the original design for this bridge in the form of wind-ties between the upper booms of the main girders and of short girders between the pier columns at low-water level.

* It was opened for traffic on the 16th May 1881.

Nerbudda Bridge.

Godhra Extension.

In March 1881 sanction was accorded to the extension of the Dakor Branch of the Bombay, Baroda and Central India Railway from Pali to Godhra (17 miles), with a low level bridge over the Mahi river near Pali. This is the only engineering work of importance on this branch.

MADRAS.

Madras Railway.

On the Madras Railway no extensions have been made; but the line from the Bangalore station to Bangalore city, 3 miles in length, which had been constructed by the Mysore Government, was taken over by the Madras Railway Company in October 1880, as part of their guaranteed undertaking, and is being worked as an integral portion of that Railway.

The embankment between Kadambatur and Arconum, which slipped in October 1879 and caused a disastrous accident, was made good, and the line over it reopened for traffic in June 1880; and although the monsoon was very heavy in the following October, the line throughout stood well.

Cheyer Bridge.

The new Cheyer Bridge, 50 spans of 64 feet, was opened for traffic in May 1880. The work of fitting the whole of the rolling stock with electrical apparatus for intercommunication was completed by the end of the year.

The financial returns of this Railway show a falling off in the gross earnings, which are lower this year than in any year since 1874. The financial prospects of this line are not cheering. An analysis of the traffic figures will be found in Chapter IV.

South Indian Railway.

Twenty-one miles were added to the open mileage of the South Indian Railway during the year, *viz.*,—

		Miles.	Date of opening.
Chingleput to Walajabad	...	13	1st August 1880
Walajabad to Conjeveram	...	8	1st January 1881

The opening of the line from Chingleput to Conjeveram completes the South Indian Railway system, and connects this line with the Madras Railway at Arconum, thus enabling traffic exchanged with the Madras Railway to be carried by a direct route, instead of going around by Madras, and effecting a saving of 38 miles.

The bridge over the Gingee river will shortly be opened for traffic, and will connect the South Indian Railway with the French Section (7½ miles) of the Pondicherry line. The work at this bridge was delayed in November last by a severe cyclone, which swept over the Chingleput, South Arcot, Tanjore, and Trichinopoly districts, severely breaching the South Indian line in its course.

CHAPTER III.

CONSTRUCTION AND SURVEY.

PUNJAB AND SIND.—Punjab Northern Railway—Extension towards Peshawar demanded by military operations—Jhelum-Rahtial Section opened on 1st January 1880—Difficulties of construction—Rahtial Ravines—Bakrala Bridge—Sohawa Tunnel—Nili Viaduct—Sohawa Viaduct—Bishendor Bridge—Sohan Bridge—Pindi to Attock—Bridge over the Indus at Attock—Pindi-Kohat line—Recapitulation of difficulties of construction—Salt Branch—Salt Range coal—Proposed extensions to Khewrah; to Khushab; to Bhera and Shahpur—Indus Valley and Kandahar Railways—Military occupation of Southern Afghanistan necessitated a line of Railway—Waterless tract of 90 miles—Kandahar Railway, Lower Section—Kandahar Railway, Upper Section—Route up the Bolan Pass abandoned; and a line up the Harnai Valley located and construction commenced—Railway works raided by Marri tribes and work stopped—Branch from Sibi to Pir Chauki. NORTH-WESTERN PROVINCES AND OUDH.—Muttra-Hathras Railway—Cawnpore-Farukhabad Railway—Ghazipur-Dildarnagar Railway—Muttra-Achneyra Railway—Patna-Bahraich Survey—Cawnpore-Farukhabad Extension Survey—Bhaupur-Kalpi Survey—Bareilly-Pilibhit Survey. BENGAL. Tirhoot Railway Extensions—Calcutta and South-Eastern Railway Extensions—Kaunia and Dhurla Tramway—Darjeeling Steam Tramway—Northern Bengal Railway Extension—Dacca and Mymensingh Survey—Bengal Central Railway—Palamow Project—Chota Nagpore Project—Deoghar Steam Tramway—BOMBAY AND CENTRAL INDIA.—Rajputana Railway—Holkar and Sindia-Neemuch Section—Neemuch-Nasirabad Section—Holkar and Sindia-Neemuch Railways—Neemuch-Nasirabad Railway—Sindia Railway—Chambal Bridge—Bombay Eastern Deccan Railway—Barsi Survey. CENTRAL PROVINCES.—Nagpur and Chhattisgarh Railway—Extension Survey. MADRAS.—South Indian Railway—Gingee Bridge—Madura-Paumben Extension—Nilgiri-Rigi Railway Company—Cochin and Travancore Railway Company—Bellary-Hospett Extension. BURMA.—Rangoon and Sittang Valley Railway—Rangoon and Irrawaddy Valley Railway. NATIVE STATES.—Bhopal Railway—Kathiawar or Bhavnagar-Gondal Railway—Gaekwar of Baroda's Railway—Khamgaon and Amraoti Railway—The Nizam's Railway—Mysore Railway.

PUNJAB AND SIND.

Punjab Northern Railway.

THE murder of the British Envoy in Afghanistan in September 1879, and the consequent occupation by our troops of Kabul and the Khyber Pass, rendered it necessary to establish with all possible speed a line of Railway, connecting our North-West Frontier with the sources of supply in India. This was the more imperative, because the first campaign in 1878 and the advance of our troops in the autumn of 1879 had seriously drained the frontier districts of their ordinary means of transport, almost every available beast of burden having been hurried up to the front to supply transport for the army. The terminus of the Punjab Northern Railway at this time was at Jhelum, and every nerve was strained to push on the Railway towards Peshawar, a distance of 176 miles.*

Extension towards Peshawar demanded by military operations.

	Miles.
* Jhelum to Rawalpindi ...	71
Rawalpindi to the Indus river ...	63
Indus river to Peshawar	42
	176

By the 1st January 1880 the section from Jhelum to Rahtial, 14¾ miles, had been opened, the country up to the latter place presenting no extraordinary difficulties. At Rahtial, however, the Railway enters into a rugged and mountainous tract seamed with deep ravines and fissures. At Rahtial itself such heavy cuttings and culverts were required, that a temporary diversion was necessary; and although every effort has been made to complete the permanent line through these Rahtial ravines, the trains still work over the temporary diversion first established with grades of 1 in 50.

Jhelum-Rahtial Section opened on 1st January 1880.

Difficulties of construction.

Rahtial Ravines.

Bakrala Bridge.

At the 123rd mile from Lahore the Bakrala river crosses the line. This was spanned by a bridge consisting of—

4 spans of 120 feet lattice girder,
1 span „ 80 „ web „

and by the 1st June 1880 an engine was able to pass over this structure.†

† Height of rail-level above bed, 85 feet.
Masonry in bridge, 157,730 cubic feet.
Concrete, 25,236 cubic feet.

The next obstacle was encountered at mile 128 near Sohawa, where a tunnel 539 feet long had to be driven through rock. The use of dynamite facilitated operations here, and the tunnel had been completed and lined throughout by the time that the Bakrala bridge was ready.

Sohawa Tunnel.

Nili Viaduct.

* Height of rail-level above nala, 50 feet.

A mile beyond the tunnel the Nili viaduct* was bridged by—

4 spans of 20 feet.
1 span „ 30 „

This was completed in May 1880.

The completion in the same month of the Sohawa viaduct at mile 129¼, with its three spans† of 60 feet on masonry piers, enabled an engine to run through to Bishendor bridge at mile 134½ as soon as the Bakrala bridge had been finished.

Sohawa Viaduct.

† Rail-level above bed of river, 50 feet.

At Bishendor the site of the bridge had to be shifted, owing to a bad landslip that occurred at the position originally selected for the crossing. Three girders of 120 feet‡ each were taken from the Chenab bridge and used here. The nature of the ground necessitated also a high retaining wall at the south abutment. Here, as at the Bakrala bridge, work was prosecuted day and night from the commencement to the finish; and by the 8th June 1880 an engine was got across this bridge.

Bishendor Bridge.

‡ Rail-level above bed of river, 85 feet.

By the 8th June 1880 an engine had crossed the Baikhan bridge, one span of 140 feet, and had reached the Sohan river,§ 7 miles from Rawalpindi. At this part of its course the Sohan runs rapidly over a shingly bed, and the proximity of the stream to the hills renders its floods during the rainy season extremely sudden and fitful. It was during one of these violent floods that the iron staging, which had been laboriously put together for the erection of the girders, was nearly all washed away. Military necessities, however, pressed urgently for the completion of this link in the communication to Rawalpindi; and notwithstanding the previous failure of the staging, the Government of India issued orders to erect the girders during the rains, preferring to run the risk of losing a spare span of girders to the certainty of the delay of months that would be involved by waiting until all changes from floods were at an end. The ultimate success of the undertaking justified the venture. For the erection of the girders an ingenious form of scaffolding was designed, which diminished the chances of the staging being again undermined by the current, by removing the foundations of the staging above the influence of the stream. The foundations of the staging thus, instead of being in the bed of the river, rested in recesses cut in the stone piers of the bridge. The staging itself consisted of trestles made of derrick poles braced together and strengthened by sleepers. These trestles were put together on the ground and hoisted entire into position, their shape being a huge triangle with a short base and two long sides, of which the apex rested in the recess cut in the pier and the two long sides projected towards the centre of the girder to be erected; the short base of the triangle came under the roadway and afforded points of support for the girder to rest upon. On the 13th September all wedges were struck; by noon on the following day the road was completed; on the 15th September the bridge was opened.

Sohan Bridge.

§ 167 miles from Lahore.

The intense heat, the constant duststorms, the frequent rains, the numerous floods, and the constant illness of the Europeans employed on the work were the cause of great anxiety and difficulty; and the arduous nature of

the operations at the Sohan may best be appreciated by the following extracts from the diary of the Executive Engineer in charge of the construction of the bridge :—

July 23*rd*.—Only one European subordinate on the works, all the rest being ill.

„ 30*th*.—Flood of 8 feet. Two men carried off by the stream, but saved.

„ 31*st*.—Very heavy storm of wind and rain. Flood of 9 feet. Tender of engine washed down-stream about 40 feet against pier of bridge and half-buried.

August 2*nd*.—Flood of 9 feet.
„ 12*th*.— „ „ 5 „
„ 16*th*.— „ „ 7 „
„ 28*th*.— „ „ 10 „

September 5*th*.—Flood of 13 feet. Work entirely stopped. The staging was not expected to stand.

	Miles.	Date of opening.
* Jhelum to Rahtial ...	14¾	1st Jan. 1880
Rahtial to Rawalpindi...	53	1st Oct. 1880

The completion of the Sohan bridge carried the Railway into Rawalpindi.*

Pindi to Attock.

Between Rawalpindi and the Indus river, 63 miles, the deep fissures and ravines are not so numerous, but the country is still mountainous and rugged.

The formidable Margalla Hills have to be pierced by a tunnel, 1,100 feet long, emerging close to the point where the monument to General John Nicholson has given the name of Jani-ka-Sang (the native pronunciation of John Nicholson) to the locality; and the Haro† and Chablat‡ rivers have to be bridged. Bridges are also needed at Jani-ka-Sang,§ Kala-ka-Serai, Bodho, and Haji Shah. A temporary line was hurried through, a liberal use being made of steep gradients on the temporary diversions made to turn the heavy permanent works, and the line‖ itself being laid in some places on the Grand Trunk Road. Temporary bridges were thrown over the rivers, and the construction of the permanent structures pressed¶ on; and on the 1st January 1881 the line was thrown open to Haji Shah, 58 miles; and on the 5th April the intervening 5 miles to Attock were ready, and an engine reached the left bank of the Indus.

† 212 miles from Lahore.
‡ 206 „ „ „
§ 190 „ „ „

‖ On this section there are 14 miles of line on a gradient less than 1 in 100.

	Feet.
Gradient from 1 in 90 to 1 in 99 ...	6,000
„ „ 1 „ 70 „ 1 „ 79 ...	19,700
„ „ 1 „ 60 „ 1 „ 69 ...	16,900
„ „ 1 „ 50 „ 1 „ 57 ...	14,500
„ „ 1 „ 40 „ 1 „ 50 ...	17,300
	74,400

¶ Jani-ka-Sang 4 spans of 40 feet (temporary).
Kala-ka-Serai 1 span „ 75 „ („).
Haro 10 spans „ 40 „ („).
Haji Shah 2 „ „ 40 „ („).
Bodho 2 „ „ 60 „ (permanent).
Chablat 5 „ „ 60 „ („).

Bridge over the Indus at Attock.

Here preparations were in progress for a permanent bridge. The site selected for this bridge is a little below the old Sikh fort of Attock, underneath whose ancient walls the Kabul river unites its waters with the mighty stream of the river Indus. Below Attock the united rivers are pent up between high walls of rock on each side; and at a point some two miles below their junction salient bluffs on each bank and a partially submerged rocky island in mid-stream afford facilities for throwing a bridge across the river with spans not exceeding 300 feet in the clear.

This bridge is now in course of construction. It consists of two spans of 300 feet over the main channel, and of three spans of 250 feet to connect these central spans with the banks. The main girders are 117 feet above the ordinary level of the river; they are of steel with open bracing, and carry the railway on the top and a roadway for ordinary traffic or for artillery below. The locality being subject to earthquakes, it has been deemed advisable not to use stone for the construction of the piers, but to support the girders on piers made of steel and strongly braced. These piers are protected from the effects of the huge trees and other débris that are swept down by

the stream by means of concrete cutwaters which are placed up-stream and slightly in advance of the steel piers.

The steel and iron work for this bridge have been received in India, and the submerged portion of the rocky island, which will form the support of the pier in the middle of the stream, has been raised to a sufficient height above low water to enable the pier to be erected as soon as the river resumes its cold weather level. The site for the crossing is beyond the region of cyclones or extraordinary gales of wind; but ample provision has been made for any wind stress that may come upon the structure.

Staff quarters and temporary workshops have been erected at site, and the work will be rapidly pushed forward during this working season, and will probably be completed by the commencement of 1883.

Pending the completion of this permanent structure, a temporary bridge-of-boats had been thrown across the river, capable of carrying the rails necessary for the prosecution of the Railway from the right bank of the Indus to Peshawar, 45 miles.

After once passing for a couple of miles through heavy rock-cuttings and tunnels in the precipitous hills which abut on to the Indus at Attock and confine its stream between high walls of rock, the line enters into the valley of the Yusufzai, and runs on through a level country to Peshawar.

Beyond some heavy bridging needed to give waterway to the floods to which this tract is exposed when the Kabul river overflows its banks, no engineering difficulties are offered; and by the end of 1881 the Railway will have probably been opened and through communication established from Lahore to Peshawar, with the exception of the break at the Indus river, where, however, the permanent bridge, it is anticipated, will be completed by the commencement of 1883.

Pindi-Kohat line.

While provision was being thus made for the garrisons of Kabul and the Khyber, another Railway was being constructed to give a line of communication with India to the British forces in the Kuram Valley.

Branching off from the main line of the Punjab Northern Railway at Tarnaul, a station 11 miles west of Rawalpindi, this Pindi-Kohat Section as it is called is laid for 67 miles until it reaches the left bank of the Indus at Khushalgarh. It was originally intended that the line should be prolonged to the frontier post of Kohat; but the evacuation of the Kuram Valley has rendered the further prosecution of the project unnecessary.

The Railway is laid as a surface line, with a ruling gradient of 1 in 70, as far as Langar, 58¼ miles from the junction; beyond Langar to Khushalgarh, 8¾ miles, the steepest gradient is 1 in 50. The waterways* crossed are comparatively unimportant.

* *List of waterways.*

Meloom	1 span	of	60 feet.
Nundna	3 spans	„	60 „
Kirli	2 „	„	60 „
Daryana	1 span	„	60 „
Kamilpur	3 spans	„	60 „
Kuttra	2 „	„	60 „
Sakh	2 „	„	60 „
Domel	1 span	„	60 „

Commenced in September 1879, half the line was laid by the beginning of December 1880. By the end of the following March the whole of the road was completed, and in April 1881 it was opened for traffic on the following dates:—

	Miles.	Date of opening.
Turnaul to Langar	58¼	1st April 1881
Langar to Khushalgarh	8¾	5th April 1881

Recapitulation of difficulties of construction.

The extreme difficulties and hardships to be overcome in thus incessantly pressing on the construction of these military lines of railway through summer and winter by day and by night will be best appreciated by those who know the trying changes of the Punjab climate and have felt the piercing cold of its winter nights and the burning heat of its summer sun. Nor did the difficulties of the engineers end here. The country through which the Railway passes is thinly populated, and a scanty rainfall had made grain scarce and dear. The beasts of burden which in ordinary circumstances would have supplied the means of transport for railway material and stores had been absorbed for the transport of the troops; and the Punjab camels and mules and horses were perishing amidst the snows of Kabul, or painfully laboring through the sterile passes of the Bolan. Commissariat arrangements, transport, and hospital requirements, as well as the necessities of the fighting line, had to be constantly replenished, until the Punjab was drained of men and of animals. The border tribes, who generally furnish large parties of laborers to the Punjab, were too interested in the struggle that was going on to care to leave their own country.

Even when gangs of laborers had once been got together, it was no easy task to prevent them from deserting the railway works in order to accept the higher rates of pay that were being offered on all sides by the officers recruiting for men to supply the waste of war.

It has been shown above that these obstacles were surmounted. Large gangs of workmen, amounting to over 40,000 men, were assembled from long distances down-country; special arrangements were made for feeding such large numbers; every possible means to urge on the work was adopted. The use of the electric light enabled work to be carried on by night, warm clothing being supplied to those who had to toil during the night and in exposed positions.

The results of this unceasing toil have been given above. The officers employed in the construction of the Punjab Northern Railway well earned the recognition of their services which Government accorded* to them on the completion of their labors.

* Government Resolution No. 854-68R.-C. of 11th November 1880.

Salt Branch.

Whilst railway communication in the Punjab was thus pushed on to meet the stress of military operations in Northern Afghanistan, the metre gauge line, branching off from the Punjab Northern main line at Lala Musa,† was also being constructed. This line has been made to facilitate the transport of salt from the Mayo Salt Mines at Khewrah. It runs through a flat, easy country, and was opened for traffic from Lala Musa to Miani, 54 miles, as under:—

† Lahore to Lala Musa, 82 miles.

	Miles.	Date of opening.
Lala Musa to Bhaodin	28½	1st January 1880
Bhaodin to Hurriah	10	1st February 1880
Hurriah to Miani	15¼	10th April 1880

Salt Range coal.

Besides affording conveyance for salt, this branch will develop the working of the coal that is found in the Salt Range not far from Khewrah, and with which experiments have been made during the year.‡ With the view of further promoting this industry, and of saving the 10 miles of camel transport which the salt consignments now have to undergo between the mines and Miani, a project was submitted this year for extending the Railway from Miani to Khewrah, with a bridge over the Jhelum near Pind Dadan Khan. §

‡ See Chapter V.

Proposed extensions to Khewrah;

	Miles.
§ Miani to Jhelum river ...	3
Jhelum river to Pind Dadan Khan...	2
Pind Dadan Khan to Khewrah ...	5

to Khushab;

From Pind Dadan Khan it was also proposed to run another line to Khushab, and thence wes twards towards Dera Ismail Khan, where the traffic from the Gumal pass comes in. The cost, however, of the

bridge over the Jhelum, estimated at 14 lakhs, led to the submission of alternative projects for extending the line towards Bhera, 10 miles, and thence on to Shahpur, both of which towns are on this side of the river.

to Bhera and Shahpur.

The working results of this Salt Branch line are extremely encouraging, and are detailed in the following chapter. In the first fifteen months of its opening the Salt Branch line has earned over 6 per cent. on its capital cost.

Indus Valley and Kandahar Railways.

Chapter I contains an epitome of the leading events on the Kandahar line during the year.

These need not therefore be recapitulated here; but the following details will be of interest regarding the—

(1) Lower Section of Kandahar Railway: Ruk to Sibi.
(2) Upper Section of Kandahar Railway: Sibi to Kandahar.
(3) Pir Chauki Branch.

Military occupation of Southern Afghanistan necessitated a line of Railway.

The war in Afghanistan had necessitated the construction of a line of railway from our base of operations towards the advanced position held by our troops at Kandahar. The alignment selected for this military line branched off from the Indus Valley Railway at a roadside station named Ruk, 15 miles west of Sukkur, and, running past Shikarpur, an important entrepôt of Central Asian trade, and then past our cantonment of Jacobabad, it entered on a desolate and barren desert, which for 90 miles of its length was almost destitute of water. The work of laying this line was commenced in October 1879 and completed on the 14th January 1880, special arrangements having to be made for supplying water and food to the gangs of workmen employed in the inhospitable "*put*," or desert. During the year under review a side trench and bund were completed alongside the line for its protection from flood spills, and the main embankment was raised. Large reservoirs were excavated at the desert stations for the storage of this flood water; the temporary bridges were replaced by permanent structures; and makeshift station and staff buildings were first run up temporarily, and afterwards gradually improved, so as to afford better protection against the intense heat.

Waterless tract of 90 miles.

Kandahar Railway, Lower Section.

The following extracts from the Progress and Administration Report of the Kandahar Railway give in more detail the progress made in bridging and ballasting this section of the line:—

The Engineer-in-Chief in charge of the Lower Section of the Kandahar State Railway throughout the year was independent of the Manager. This branch line during the year was divided into two executive divisions, *i.e.*,—

Jacobabad from 0 to 75 miles.
Mittri „ 75 „ 133 „

At the beginning of the year (1880-81) there were no buildings of any kind on the Railway; the officers and staff had to be accommodated in tents; temporary buildings for immediate shelter had therefore to be run up in the most rapid manner.

Earthwork.—There has been a considerable quantity of earthwork executed in forming reservoirs for water at the desert stations, and also in throwing up bunds round the desert stations, approaches to bridges, and in improving the gradients in several places.

Bridgework.—All the bridges, Ruk to Jutput, are finished, with the exception of a few field irrigation drains. In the desert fifty-three 20-feet girder openings have been finished, and there is a three 40-feet girder bridge in progress, leaving only two large bridges to be taken in hand after the floods. Several culverts of 10 and 5 feet spans have been built, but there are still several to build on the Pir Chauki Extension. On that section only the two principal bridges have been commenced, *viz.*,—

The Nari—7 spans of 100 feet
„ Kumri 3 „ 60 „
} well foundations.

On the 31st March 1881 one-third of the sinking of the foundation wells had been done at the former and one-fifth at the latter.

Ballasting.—From Ruk to Shikarpur the line has been ballasted with broken stone brought from Sukkur by train; from Shikarpur to Jutput brick ballast was made in kilns alongside the line; 66,000 cubic feet per mile had been made on 31st March 1881, and about three-fourths of this were spread on line throughout this distance on that date.

The ballast for the desert, from Jutput to Nuttall, will be broken stone brought from Sukkur by train; the remainder will be small shingle from Sibi.

On 31st March 1881 20 miles of the desert line had been ballasted, and there were 2,300,000 cubic feet collected in depôt at Sibi.

Kandahar Railway, Upper Section.

The Upper Section of the Kandahar Railway runs from Sibi northward in the direction of Kandahar, and is a continuation of the Lower or Jacobabad Section. In a purely military point of view, an alignment would have been desirable that took a railway up the Bolan pass. But although attempts have been made ever since the beginning of 1877 to find a route in this direction, any such project has now been abandoned as impracticable on account of excessive cost. The narrowness of some of the defiles, notably of the gorge at Kundalani; the extreme violence of the floods which pour their torrents through these confined channels, and which would necessitate embankments over 25 feet in height; the heavy bridging and tunnelling works required, and the severe gradients involved —all contributed to prevent the preparation of a reasonable scheme for a railway line up the Bolan pass itself; and, notwithstanding the extreme reluctance of the military authorities to abandon this alignment, an alternative project had to be prepared.

Route up the Bolan Pass abandoned;

and a line up the Harnai Valley located.

A line was eventually explored which, leaving Sibi, ran through the Nari gorge up the valley of the Nari river, and thence passed by Kuchali, Harnai, Sharigh, and Durgai, where it encumbered the Chappar rift, where a high mountain range has been rent by a convulsion of nature, leaving a deep and precipitous cleft, through which a torrent now pours its waters. This obstacle was to be surmounted by a series of high level galleries and tunnels, and the railway would be constructed to Kach, and, crossing a kotal near Brahiman, where it would reach its highest point, would go on to Ghourki, and then debouch on the plains of Pishin. The project then took the line near Bostan, from which place, at a point named Kasim Kila, it sent off a branch line to the fort at Quetta, passing round the south-western spur of the Sokatu range. From Bostan the main line was to cross first the Kakar-Lora and then the Lora rivers, and, passing Gulistan Karez, it was to cross the Khwaja-Amran range by the Tope kotal near the Gwaja pass, and so into the plain country at the foot of that range until it neared Kandahar and became in reality the Kandahar Railway.

Preliminary reconnaissances of this line were made in 1879, and this year the line was surveyed throughout and was partially staked out.

and construction commenced.

The construction of the line itself began in the middle of January 1880, the working parties following close on the heels of the surveyors; and at the time of the Maiwand disaster the following was the state of the railway works.

Engines were running from Sibi to Nari gorge, $7\frac{1}{4}$ miles, and from Nari gorge onwards $12\frac{1}{2}$ miles of bank had been nearly completed and platelaying commenced. Buildings for officers and subordinate staff had been more or less completed at Sibi, Nari gorge, Khelat-i-Kila, Gundakinduff, Kuchali, Zindagiab, Dulojal, Spintangi, Harnai, Nasik, and Sharigh. Defensible storeyards had been also built at all these places and at Kach.

A service road had been constructed from Sibi nearly through to Kach and on to Quetta and Gulistan Karez, along which a cart could be driven, except

through the Chappar rift. This could only be crossed by transport animals, but a cart-road was being constructed here also, which was subsequently finished. Large stores of dynamite and of stores and tools had been collected at each end of the Chappar rift itself for the excavation of the heavy tunnels and galleries.

Railway works raided by Marri tribes

The victory of Ayub Khan at Maiwand was followed by the withdrawal of the garrisons which, for the better protection of the line, were posted in the defensible posts above enumerated; and the Marri tribes attacked the forces as they withdrew and raided the railway works, doing what damage they could to the buildings and scattering the contents of the dynamite cases. A punitive expedition was sent in consequence through the Marri country in October 1880, when compensation was exacted for the outrages perpetrated, and the works were once more partially recommenced, but were shortly after discontinued and the spare stores sent back to Sibi. The existing buildings were not dismantled however, and such parts of the line as had been already laid were not lifted.

and work stopped.

Branch from Sibi to Pir Chauki.

Although it was found that the Kandahar Railway could not be prolonged up the Bolan pass, it was determined to carry it up to the mouth of that defile until the alternative line up the Harnai valley should be open. A branch from Sibi was accordingly rapidly run out to Pir Chauki, 19 miles, the work commencing on the 30th July 1880 and being completed on the 20th of the following October, notwithstanding a violent flood in the Nari river, which washed away the temporary pile-bridge which had been thrown over that stream.

This flood was not the only cause of delay to the work. The country traversed by the line was not easy, like that of the *put*, or desert, but owing to its undulations necessitated cuttings, which proved to be more formidable undertakings than had been anticipated, owing to the presence of an unforeseen stratum of sandstone and deep clay a couple of feet below ground-level.

The following bridges had also to be constructed, *viz.*,—

Nari River	...	Timber pile bridge of		446	feet	in length,
Kumri River	...	„	trestle „	168	„	„
Spill from Bolan River	...	„	„ „	154	„	„
Spill from Kumri River	...	„	„ „	84	„	„

besides several smaller bridges of sleeper stacks over irrigation channels.

The temporary bridges over the Nari and Kumri are being replaced by permanent structures. Temporary troop platforms were erected at Nari bank and at Pir Chauki, and the line proved of the very greatest service in transporting the troops to the foot of the Bolan hills, on their way to and from Kandahar.

NORTH-WESTERN PROVINCES AND OUDH.

The Administration and Progress Report of the North-Western Provinces and Oudh contains the following details concerning the survey and construction of Railways in those Provinces during the official year:—

PROVINCIAL LINES.

PRODUCTIVE PUBLIC WORKS.

Muttra-Hathras Railway.

This line was opened for public traffic on 19th October 1875. A description of its working will be found in the following chapter.

Cawnpore-Farukhabad Railway.

This line, constructed on the metre gauge, was partially opened for traffic on the 15th December 1880 as far as Miran Serai, a length of nearly 49¼ miles. On the 1st February 1881, after completion of the Kali Nadi diversion, the remaining section to Farukhabad was also opened, making a total length of line of 86 miles. It was thus worked for 48 days over 49 miles, and for 59 days over the whole 86 miles.

The capital expenditure to 31st March 1881 amounted to Rs. 30,45,749, or for 86 miles a rate of Rs. 35,416 per mile to date; but there is still considerable further outlay to be incurred against capital, chiefly on account of rolling stock, the Kali Nadi bridge and other works in progress but not completed during 1880-81.

The following table shows the capital expenditure during the year and to date:—

Heads of expenditure.	Regular Estimate, 1880-81.	Expended during 1880-81.	Expenditure to 31st March 1880.	Total expenditure to 31st March 1881.	Sanctioned Estimate (recast).
	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	8,600	10,845	21,332	32,177	32,418
Land	24,800	22,124	31,197	53,321	61,024
Construction of line	1,00,000	1,15,760	3,00,631	4,16,391	4,40,124
Ballast and Permanent-way	1,79,000	1,91,374	12,16,469	14,07,843	14,80,773
Stations and Buildings	1,41,700	1,62,060	1,48,818	3,10,878	3,55,502
Total Construction Account ...	4,55,100	5,02,163	17,18,447	22,20,610	23,69,841
Plant	8,000	11,609	28,803	40,412	43,403
Steam Ferries	...	...	...	...	...
Rolling Stock	5,32,600	5,29,358	21,405	5,50,763	6,02,000
Establishment	60,000	57,418	1,42,618	2,00,036	2,02,503
Total Final Heads ...	10,55,700	11,00,548	19,11,273	30,11,821	32,17,747
Suspense Accounts ...	15,700	31,497	6,65,635	34,138	...
Grand Total ...	10,40,000	10,69,051	19,76,908	30,45,959	...

The actual expenditure in 1880-81 was Rs. 10,68,956—

	Rs.
English	3,57,858
Indian	7,11,098

against a budget grant of Rs. 10,40,000—

English	3,44,000
Indian	6,96,000

or an excess during the year of Rs. 28,956—

English	13,858
Indian	15,098

The original sanctioned estimate, Rs. 32,23,021, has not been exceeded; but as there had been considerable differences in heads of expenditure due to alterations found necessary from time to time, it was recast during the year, and finally stood at Rs. 32,17,747. The increases on some heads were more than covered by savings in others, especially under permanent-way, due to the favorable terms on which the rails were procured.

The principal works executed during the year and the condition of the line on the 31st March 1881 were as follows:—

I.—Preliminary Expenses.

Completed in previous year.

II.—Land.

Nearly all the land required, taken up and paid for during the year.

III.—Construction of Line.

Earthwork.—The small proportion left unfinished in 1879-80, completed during the year.

Bridgework.—Completed during the year, except the Kali Nadi bridge in 69th mile (5 spans of 60 feet each), where two of the wells gave trouble. A diversion was constructed to carry the line, pending the completion of this bridge, which has since been finished and passed by the Consulting Engineer on the 30th June 1881.

Level-crossings, &c.—Nearly all completed during the year, one or two gates only at the Farukhabad end remaining unfinished.

Fencing.—Almost completed to the extent proposed for the line at present.

IV.—Ballast and Permanent-way.

Completed during the year, except at the Kali Nadi bridge.

V.—Stations and Buildings.

Completed during the year, except the goods-sheds at Bilhaur and Gursahaiganj and some of the staff quarters at roadside stations.

VI.—Plant.

Completed during the year.

VIII.—Rolling Stock.

Locomotives.—Ten E class tender engines erected at Cawnpore departmentally, and completed in time to do a good deal of the work of laying the line and moving ballast.

Carriage and Wagon.—The manufacture was entrusted to the shops of the Oudh and Rohilkhand Railway at Lucknow, and there was some delay in delivery, no passenger carriages being ready when the line was first opened. The total number delivered by 31st March 1881 was—

3rd class carriages	37
Brake-vans	7
Covered goods wagons	150
Low-sided trucks	50
Timber trucks	10
	254

The old telegraph line to Fatehgarh was dismantled by the Telegraph Department during the year, and a new line put up along the Railway. Every station is in connection with it, and the Government office at Fatehgarh has been abolished and the business transferred to the Railway offices.

The head-quarters of the open line were located at Cawnpore, and amalgamated with those of the Muttra-Hathras Railway, both lines being placed under one Engineer-in-Chief and Manager.

Ghazipur-Dildarnagar Railway.

This short branch line, 12 miles in length, connects the Ganges at Tari Ghat, opposite Ghazipur, with the East Indian Railway at Dildarnagar, and is constructed on the broad (5′ 6″ gauge. It was opened for traffic on the 5th October 1880, and has since been worked by the East Indian Railway under an arrangement entered into between the Government and that Company.

The capital expended on this line up to 31st March 1881 is Rs. 5,93,539, which for 12 miles gives a cost of Rs. 49,462 per mile without rolling stock, which is found by the East

Indian Railway. The following table details the capital expenditure during the year and to date as compared with the sanctioned estimate :—

Capital Appropriation and Outlay Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year adjusted to Imperial in the accounts for 1880-81.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ...	...	...	5	...	5	2,213	2,218	2,625
Land	...	1,900	1,306	...	1,306	2,743	4,049	7,875
Construction of line ...	7,000	13,200	7,005	197	6,808	68,505	75,313	1,00,659
Ballast and Permanent-way ...	15,000	55,000	55,712	...	55,712	2,94,388	3,50,100	4,19,182
Stations and Buildings ...	19,500	59,900	65,896	3	65,893	31,026	96,919	73,502
Total Construction Account...	41,500	1,30,000	1,29,924	200	1,29,724	3,98,875	5,28,599	6,03,843
Plant	2,000	1,000	2,304	...	2,304	4,285	6,589	4,200
Steam Ferries	...	...	...	...	...	...	...	...
Rolling Stock	...	...	...	...	...	...	...	...
Establishment	5,500	10,000	12,926	1	12,925	45,426	58,351	26,108
Total Expenditure on Final Heads	49,000	1,41,000	1,45,154	201	1,44,953	4,48,586	5,93,539	6,34,151
Suspense Accounts ...	...	—1,000	—3,749	...	—3,749	3,749	...	...
Grand Total Expenditure...	49,000	1,40,000	1,41,405	201	1,41,204	4,52,335	5,93,539	6,34,151

The actual expenditure in 1880-81 was Rs. 1,41,204, all in India, against a budget grant of Rs. 1,40,000, an excess during the year of Rs. 1,204, which is covered by savings on the Muttra-Hathras line. The total of the sanctioned estimate, Rs. 6,34,151, has not hitherto been exceeded, though there have been considerable excesses on some heads, especially construction of line and ballast and permanent-way, principally to meet the views of the East Indian Railway officials and the Consulting Engineer for Guaranteed Railways. But the expenditure to date by no means represents the total probable capital outlay required, as the Consulting Engineer for Guaranteed Railways, Calcutta, and the East Indian Railway authorities both represent that a considerable further expenditure, roughly estimated at two lakhs of rupees, is necessary before the line can be considered completed or be worked efficiently.

The details of these requirements are under consideration; but it is evident that if they are carried out, the sanctioned estimate, Rs. 6,34,151, will be very considerably exceeded and the line will be a very expensive one, costing between Rs. 60,000 to Rs. 70,000 per mile, without rolling stock.

Muttra-Achneyra Railway.

This line, 22¾ miles in length, is still under construction on the metre gauge, 3′ 3⅜″. It joins the Rajputana State Railway at Achneyra, and when completed is to be worked by that State Railway, pending the completion of the Jumna bridge at Muttra and the Cawnpore-Farukhabad Extension *viâ* Khasganj, after which it should form a section of a through provincial Railway from Cawnpore to Achneyra. It was originally surveyed by the Rajputana Railway authorities in 1878, and a portion of the earthwork was executed by famine labor in the same year, the expenditure to end of 1879-80 being Rs. 53,108 against a sanctioned estimate of Rs. 4,61,806. Nothing further was done until 1880-81, when funds were provided, and after revision of the surveys a revised estimate was sanctioned for Rs. 7,03,360, and construction recommenced, against which the total capital expenditure to date is Rs. 4,61,806. The estimated cost per mile for 22¾ miles is Rs. 30,916, without rolling stock, which for the present will be found by the Rajputana Railway.

The following table details the capital expenditure during the year and to date against the revised estimate :—

Capital Appropriation and Outlay Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned estimate.
	Budget estimate.	Regular estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ...	1,000	800	746	...	746	892	1,638	1,892
Land	2,500	2,000	2,037	14	2,023	6,955	8,978	11,037
Construction of line ...	45,602	42,500	48,559	...	48,559	36,929	85,488	89,170
Ballast and Permanent-way ...	1,71,732	2,85,000	88,108	...	88,108	...	88,108	4,73,861
Stations and Buildings ...	40,659	34,000	34,286	...	34,286	...	34,286	71,430
Total Construction Account ...	2,61,493	3,64,300	1,73,736	14	1,73,722	44,776	2,18,498	6,47,390
Plant	4,518	1,000	1,980	4	1,976	...	1,976	5,376
Steam Ferries	...	...	...	...	...	...	...	...
Rolling Stock	...	...	...	...	...	...	...	...
Establishment	34,889	25,000	23,612	...	23,612	8,332	31,944	50,594
Total Expenditure on Final Heads	3,00,900	3,90,300	1,99,328	18	1,99,310	53,108	2,52,418	7,03,360
Suspense Accounts	2,49,100	9,700	2,09,388	...	2,09,388	...	2,09,388	...
Grand Total Expenditure ...	5,50,000	4,00,000	4,08,716	18	4,08,698	53,108	4,61,806	7,03,360

The English expenditure booked was only Rs. 2,175 against a provision of Rs. 1,50,000, chiefly for permanent-way materials.

The total Indian expenditure during 1880-81 was Rs. 4,06,523 against a budget grant of Rs. 4,00,000, or an excess of Rs. 6,523, which is covered by savings in the Muttra-Hathras line. The following was the state of work on this line on 31st March 1881 :—

I.—Preliminary Expenses.

Completed during the year.

II.—Land.

Nearly all the land required taken up and paid up for at the close of the year.

III.—Construction of Line.

Earthwork.—All the earthwork previously completed by famine labor dressed to formation level and turfed, and work completed during the year.

Bridgework.—Completed during the year.

Level-crossings, &c.—Approaches completed. Gates and lodges not commenced.

Fencing.—No provision made.

IV.—Ballast and Permanent-way.

Ballasting.—Collection nearly completed during the year. Stone ballast for first six miles at the Achneyra end will be brought to line by ballast trains when rails are being laid. Along rest of line most of the under ballast laid along formation and top ballast collected at sides.

Permanent-way.—Sleepers collected, but only 200 tons of rails received to 31st March 1881, and no fastenings. Nothing could therefore be done towards laying the permanent-way.

V.—Stations and Buildings.

Stations and Offices.—All practically completed during the year.

Workshops and Store buildings.—No provision made.

Staff quarters.—Completed, except servants' quarters at Muttra.

Station machinery.—Watering arrangements completed, but rest of work awaiting receipt of stores from England.

VI.—PLANT.

Only about one-fourth of the estimated expenditure incurred during 1880-81.

VIII.—ROLLING STOCK.

No provision made.

The line will be opened for traffic during 1881-82, but construction has been greatly delayed by non-delivery of permanent-way materials from England, especially the fastenings. If there is no further delay, it is anticipated that it will be completed by the 15th October 1881.

LINES UNDER SURVEY.

IMPERIAL FUNDS.

Patna-Bahraich Survey.

Orders were received in March 1881 to start the survey of a Railway system in the trans-Gogra district of these Provinces. The main line would connect the north bank of the Ganges opposite Patna with the Nepalese frontier north of Bahraich *viâ* Gorakhpur, Basti, and Gonda, and such branch lines as might appear desirable as feeders were also to be surveyed. Field work was not actually commenced during the year, but preliminary operations were undertaken, the expenditure to date being Rs. 4,318 from Imperial funds.

PROVINCIAL FUNDS.

The projects already prepared by the North-Western Provinces Government for a trans-Gogra Railway system differed from that now under survey only in running south from Gorakhpur to the Oudh and Rohilkhand Railway at Jaunpur, instead of towards Patna.

Cawnpore-Farukhabad Extension Survey.

This is a project to connect the Cawnpore and Farukhabad line with the Muttra-Hathras line, and so complete the provincial communication from Cawnpore to Muttra. This system, on the completion of the Muttra-Achneyra Railway and the construction of a bridge over the Jumna at Muttra, will form a complete provincial system on the metre gauge, joining the Rajputana Railway at Achneyra. There can be no reasonable doubt that such a line would not only in itself be most desirable in the interests of these Provinces, but also be a valuable feeder to the Rajputana Railway.

The estimate, amounting to Rs. 48,000, for preliminary expenses was sanctioned, and Rs. 8,000 allotted from Provincial funds during 1880-81.

Survey operations were commenced in December 1880, and at the close of the year the complete line, 102 miles in length, from Farukhabad *viâ* Kaimganj and Khasganj to Hathras Road, had been permanently set out, levelled and check-levelled, and field work completed.

The project is being vigorously prosecuted, and the estimate will shortly be submitted, with a view to sanction being obtained and funds provided in 1882-83. The expenditure during the year and to date is Rs. 5,249.

Bhaupur-Kalpi Survey.

This line was originally proposed on the metre gauge direct from Cawnpore to the Jumna at Kalpi, in continuation of the Mau-Ranipur system, and surveys were in previous years completed from Cawnpore to Ranipur; but, at the instance of the Government of India, the Kalpi line is being resurveyed as a broad gauge line, joining the East Indian Railway at Bhaupur. This line, if carried across the Jumna and joined to the Gwalior-Bhopal system, would give a direct outlet from Rohilkhand to Bombay without break of gauge. The original estimate for preliminary expenses amounted to Rs. 10,000, but a revised estimate was subsequently sanctioned for Rs. 16,000, and Rs. 11,000 allotted from Provincial funds during 1880-81. The complete line, 33 miles in length, was permanently set out, levelled and check-levelled, and field work completed during the year.

The project, which has since received the sanction of the Secretary of State as a productive public work, is being got out as rapidly as possible. The expenditure during the year was as follows :—

	Rs.
Metre gauge line, Cawnpore to Kalpi	2,731
Broad gauge line, Bhaupur to Kalpi	8,366
Total ...	11,097

The expenditure in the metre gauge line was incurred in preparing for anticipated famine relief work in September 1880 before the broad gauge line was determined upon.

Bareilly-Pilibhit Survey.

This is a metre gauge line from Bareilly to Pilibhit, and is the continuation of a through provincial line from Jaunpur *vid* Partabgarh, Rai Bareli, Lucknow, Sitapur, Lakhimpur (Kheri), and Gola Gokarnath towards Bareilly. The present project leaves the proposed Bareilly-Ranibagh Railway about 4½ miles north of Bareilly; but it is a question whether, if the latter undertaking is really to be carried out, it would not be better to run into it at Richah, about 21 miles further north, and so shorten considerably the new line from Pilibhit.

The first estimate for preliminary expenses was sanctioned for Rs. 36,357, and Rs. 11,000 allotted from Provincial funds during 1880-81; but the estimate was subsequently revised, and now stands sanctioned for Rs. 54,248. The surveys, which had been in abeyance since 1879-80, were taken up again on a new alignment in October 1880, and the complete line, 33 miles in length, was permanently set out, levelled and check-levelled, and all field work completed during the year.

This project, which has since received the sanction of the Secretary of State as a productive public work, is being prepared as rapidly as possible, that the estimate may be sanctioned and funds allotted for construction in 1882-83.

The total expenditure to date on preliminary expenses is Rs. 42,920, of which Rs. 11,632 was during 1880-81 on the revised project.

The following table shows the Capital outlay during the year on Railways in these Provinces :—

Railways.	Amount.	Increase and decrease of suspense balance.	Total.
IMPERIAL. *Productive Public Works.*	Rs.	Rs.	Rs.
Muttra-Hathras	2,541	— 11,691	—9,150
Ghazipur-Dildarnagar	1,44,953	— 3,749	1,41,204
Cawnpore-Farukhabad	11,00,453	— 31,497	10,68,956
Muttra-Achneyra	1,99,310	+ 2,09,388	4,08,698
Total ...	14,47,257	+ 1,62,451	16,09,708
Surveys.			
Patna-Bahraich	1,018	+ 3,300	4,318
Total ...	1,018	+ 3,300	4,318
PROVINCIAL. *Surveys*			
Bareilly-Pilibhit	10,676	+ 956	11,632
Mau-Ranipur	— 1,461	...	— 1,461
Banda-Manikpur	— 1,596	...	— 1,596
Jaunpur	— 634	...	— 634
Gorakhpur	— 637	...	— 637
Gonda	— 531	...	— 531
Lucknow	— 846	...	— 846
Moradabad	530	...	530
Bhaupur-Kalpi	11,083	+ 14	11,097
Cawnpore-Farukhabad Extension	5,200	+ 49	5,249
Total ...	21,784	+ 1,019	22,803

GENERAL.

The following is the total Capital expenditure during the year and to date on all State Railway projects in these Provinces :—

Projects.	Outlay.		
	To 31st March 1880.	During 1880-81.	Total on 31st March 1881.
	Rs.	Rs.	Rs.
Muttra-Hathras	10,95,620	—9,150	10,86,470
Ghazipur-Dildarnagar	4,52,335	1,41,204	5,93,539
Cawnpore-Farukhahad	19,76,793	10,68,956	30,45,749
Muttra-Achneyra	53,108	4,08,698	4,61,806
Imperial Surveys	...	4,318	4,318
Provincial Surveys	3,56,201	22,803	3,79,004
Total ...	39,34,057	16,36,829	55,70,886

BENGAL.

The following Railways and Tramways under the administration of Bengal are either in course of construction, under survey, or projected :—

Under construction.

I. The Tirhoot State Railway Extensions to Pipra Ghat and Bettiah.
II. The Calcutta and South-Eastern State Railway to Diamond Harbour.
III. The Kaunia and Dhurla Steam Tramway.
IV. The Darjeeling Steam Tramway (a portion open for traffic).

Surveyed or projected.

I. The Northern Bengal State Railway Extensions to Dinagepore and Caragola.
II. The Dacca and Mymensingh State Railway.
III. The Bengal Central Railway.
IV. The Palamow, Daltongunge and Baroon Railway.
V. The Chota Nagpore Railway.
VI. The Deoghar Steam Tramway.

The following information regarding these lines is extracted from the Progress and Administration Report of the State Railways in Bengal for 1880-81 :—

Tirhoot Railway Extensions.

Extensions to Bettiah and Pipra Ghat.—The construction of the extensions Muzaffarpur to Bettiah, 75 miles, and Darbhanga to Pipra Ghat, 28 miles, sanctioned in July 1880, has now been commenced, the work being carried out by contract.

The most important works are the Dundah, Dhanauli, Kharwa, and Bolan bridges, but, except these, there are no works of any magnitude on either section; and although (*vide* the Contract) the lines should be completed by December 1882, they should, if the works are carried on expeditiously, be opened some months before that date. The estimates amount to 44 lakhs of rupees; but this sum is likely to be exceeded, and the Secretary of State's sanction to an outlay of sixty lakhs has been obtained.

These extensions pass through highly cultivated and populous districts, and tapping, as they will, the product of Nepal and North Behar, may be expected to vastly increase the traffic of the Tirhoot line.

Calcutta and South-Eastern Railway Extensions.

Extensions to Sonapur and Diamond Harbour.—From Sonapur, a station on the 10th mile from Calcutta, the line is to be extended (on the 5′ 6″ gauge) to Diamond Harbour, a length of 28¾ miles. The section to Magra, 15 miles, is already under construction, and the remaining portion to Diamond Harbour will shortly be put in hand as a feeder road, pending sanction of the Government of India to its construction as a railway. There are no works of any magnitude on this extension, and the line to Magra should be completed and ready for opening in April 1882. The estimated cost is Rs. 22,09,199, or Rs. 76,842 per mile. The work is being carried out from Provincial funds, under the supervision of the Superintending Engineer, Central Circle. The expenditure to 31st March 1881 was Rs. 1,29,089, against a budget allotment of Rs. 2,23,700. The construction of this branch, it is anticipated, will bring a great increase of traffic to the line, tapping, as it does, a large rice-producing district.

Kaunia and Dhurla Tramway.

Orders were issued by Government for the construction of this tramway as a provincial public work on the 12th March 1880. The line starts from the northern bank of the Teesta river, opposite Kaunia, the terminal station of the Rangpur branch of the Northern Bengal Railway; and the alignment from there to the Dhurla river is for 15 miles on a new embankment and 5 miles along an existing road. The gauge is 2′ 6″ and the permanent-way 25-lb. steel rails on sal sleepers. There were no heavy works involved, the estimated cost being Rs. 4,65,952, against which to the 31st March there had been an expenditure of Rs. 4,26,496. At that date the line was nearly completed; but certain conditions required by the Consulting Engineer to Government not having been carried out, the opening was delayed, and has now been fixed for the 1st August. It will, when opened, be worked as part of the Northern Bengal Railway system, and will provide a quicker and more direct and convenient communication between Calcutta, Western and Central Bengal, and Assam.

Darjeeling Steam Tramway.

The tramway, starting from the Siliguri terminus of the Northern Bengal State Railway, was commenced in April 1879. The first length to Kurseong, 30 miles, was opened for traffic on the 23rd August 1880; the second to Sonada, 9½ miles, on the 1st February 1881; and the third length, Sonada to Jore Bungalow, 5¼ miles, was reported ready for opening on the 24th March. Since the completion of the financial year, the whole length to Darjeeling has been opened for traffic.

There have been no serious accidents during the year, but cases of rolling-stock running off the line are not exceptional. The progress in completing the line has been retarded for various reasons inseparable from so difficult an undertaking.

The traffic arrangements, so far, have not been altogether satisfactory; and this, combined with the deficiency in rolling-stock, has caused on several occasions a complete block at Siliguri. Though the rolling-stock is fully up to the requirements of the contract, it is not up to the requirements of the traffic, which has exceeded expectations, and it is now certain that this will be considerably in excess of the amount guaranteed by Government.

SURVEYED OR PROJECTED.

Northern Bengal Railway Extension.

Dinagepore Branch and extension to the Ganges.—It has been proposed to construct from Provincial funds a branch Railway from Parbatipur station on the Northern Bengal State Railway to Dinagepore, a distance of 19 miles, at an estimated cost of Rs. 11,91,083. The general question of short branch railways as ordinary provincial public works having been referred by the Government of India to the Secretary of State, pending his reply, the work will be put in hand as a feeder road, to be completed hereafter as a railway, should sanction be given; and a grant for this purpose of Rs. 4,50,000 has been set aside for the current year. In connection with this, and a recommendation made by the Labour Emigration Commission, a reconnaissance has been carried out for a railway to a point on the Ganges opposite Sahibgunge, and is still under consideration.

Dacca and Mymensingh Survey.

The survey and project of this Railway were prepared in 1879. The object is to connect the large and important towns of Dacca, Naraingunge, and Mymensingh with the existing line of railway from Goalundo to Calcutta, and to open out the intermediate country, a tract for the most part densely populated and rich in agriculture, but at present ill-provided with internal communications or means of disposing of its produce. The total length is 128 miles and the estimated cost 126 lakhs. This very high rate is chiefly due to the bridge over the Dullassery river, which alone is estimated at 18 lakhs.

The Lieutenant-Governor is of opinion that, for many reasons, it would be better to connect Goalundo with Naraingunge by a good ferry, and thus save the expensive portion of the work. This line, it must be remembered, will probably form the first link of railway communication with Assam. The project has been approved generally by the Government of India, and has been recommended for sanction by the Secretary of State, with a proposal that it should be put next in hand on completion of the Tirhoot Railway extensions, the sections between Naraingunge, Dacca, and Mymensingh being first constructed.

As preliminary surveys only have been made, the line should be finally located, and detailed estimates submitted during the cold season of the current year, in order that when funds are available there may be no delay in making an early commencement.

Bengal Central Railway.

The surveys for these railways were carried out in 1878, 1879, and 1880, and the several projects detailed below were submitted to the Government of India for sanction in April 1880:—

I.—From Mymari on the East Indian Railway to Ranaghat on the Eastern Bengal Railway, 34½ miles.

II.—From Santipur to Bhagwangola on the Ganges, north of Moorshedabad, 83 miles.

III.—From Ranaghat to Jessore and Kulna, 82½ miles.

IV.—From Bongong to Calcutta, 47 miles.

Of these lines, III and IV are to be constructed at once by a public company, entitled the Bengal Central Railway Company, Limited, for the formation of which negotiations have been entered into between the Secretary of State and Messrs. Rothschilds. The terms of the agreement thus entered into are given *in extenso* on next page.

At the close of the financial year, the declaration for the land required had been published, and arrangements were in hand for the immediate commencement of the earthwork on the sections Ranaghat to Bongong and Dum-Dum to Baraset. These have since been completed. The first sod was turned on the 12th May last; and considering the lateness of the season when operations were commenced, and the unusually heavy and early rains, good progress has been made.

Palamow Project.

Proposals have been received from Messrs. Burn and Company to construct a line of Railway from Palamow *viâ* Daltongunge to Baroon on the Sone river. This Railway will open out the extensive coal-fields of Palamow. Certain concessions have been promised to the projectors, including a free gift of the land required for the line and a right to establish on the canal between Baroon and Buxar a system of hauling boats by means of a clip drum along a wire rope fixed on the bed of the canal, the Company undertaking to carry the mails free, and to work the passenger and goods traffic within a maximum tariff to be laid down by Government.

Chota Nagpore Project.

The Company above referred to have also asked for concessions in respect of a Railway proposed to be constructed between Barakar on the East Indian Railway and Raigarh, the point to which the Central India (Nagpur) State Railway is to be constructed, a considerable length of which is already in hand.

This Railway would reduce the distance from Calcutta to Bombay by some 240 miles, besides opening out several important coal-fields in Chota Nagpore, and serving a large tract of a rich agricultural district, at present completely trade-locked for want of better means of communication. It would probably be constructed on the broad gauge, as it will eventually form one of the trunk lines of the Indian Railway system, and the slight saving in cost that would be effected in constructing it on the narrow gauge would only probably result in heavy expenditure hereafter.

It is proposed to form survey parties during the cold season of this year to thoroughly examine the country, prepare preliminary surveys, and investigate the trade prospects of the line.

Deoghar Steam Project.

A project for a short steam tramway, 6½ miles long, between Baidynath on the East Indian Railway and Deoghar, the site of an ancient Hindu shrine, with a branch to Rohini, has been submitted to Government.

The projectors propose to construct the line on the metre gauge, and have guaranteed to complete it within twelve months of the date of Government making over the land to them. The estimated cost is Rs. 2,50,000, which will cover all expenditure, including equipment and rolling-stock. This work will probably be put in hand at an early date.

BOMBAY AND CENTRAL INDIA.

Rajputana Railway.

The Rajputana line, having been opened throughout on the 1st January 1881, is treated of in the following chapter.

Holkar and Sindia-Neemuch Section.

The Holkar and Sindia-Neemuch Railways were open from Khandwa to Rutlam,* with a branch from Fatehabad to Ujjain.*

	Miles.
* Khandwa to Rutlam ...	159
Fatehabad to Ujjain ...	12

During the year the following extensions northwards were opened—

	Miles.	Date of opening.
Rutlam to Jaora ...	20¾	25th February 1880
Jaora to Mandsaur ...	31½	8th April 1880
Mandsaur to Neemuch ...	30½	2nd July 1880

bringing the line into its northern terminus at Neemuch.

Meanwhile work had also been proceeding on the section between Neemuch and Nasirabad; and a portion of it from Neemuch to Chittor, 33¾ miles, was thrown open to traffic on the 10th March 1881, making a total of 289 miles* opened through from Khandwa in the direction of Ajmere.

Neemuch-Nasirabad Section.

	Miles.
* Neemuch to Chittor ...	277
Branch from Fatehabad to Ujjain	12
	289

This leaves a gap of 100 miles still to be completed between Chittor on the south and Nasirabad on the north. Rails have since been laid nearly throughout this length, the platelaying being pushed on from both ends of the gap; and it is expected that the line will be opened throughout from Khandwa to Ajmere, with diversions at some of the larger bridges, in November 1881, and that it will be completely bridged before the rains of 1882.

The following extracts are taken from the Administration Report of the Railway Department in the Bombay Presidency for the year under review:—

Holkar and Sindia-Neemuch Railways. The new joint goods station at Khandwa for the interchange of traffic with the Great Indian Peninsula Railway Company was proceeded with.

The temporary workshops at Khandwa were extended, and the materials of the workshops at Ahmednagar, removed on the transfer of the Dhond and Manmad Railway to the Great Indian Peninsula Railway Company, were transferred to Khandwa for the construction of an engine-erecting shop. In addition to the above, the following works were carried out, *viz.*, —weighbridge and carriage examination pit at Mhow; staff quarters at Khandwa; third and fourth class waiting accommodation at Sanawal, Barwai, and Mhow; and Police lines at Indore. Seven Fairlie engines ordered out for the Kandahar Railway were, on its being finally determined not to carry it beyond Sibi, sent to Khandwa to be used on the Choral Ghat. They have not yet been put to work, a question having been raised as to their being in excess of the weight admissible on the iron girder bridges on the Ghat. The result of further inquiry has been to show that they can be used without materially altering the bridges, and they will probably be brought into use next season.

The question of the supply of wood fuel from the Punassa forest reserve was further discussed, and a survey was made for a tramway from Mortukka station to Punassa in the forest, distant about 2¼ miles. The tramway is estimated as likely to cost Rs. 2,96,113, or Rs. 12,338 a mile; and it has to be ascertained whether its construction would pay, this depending on the quantity and price of the fuel which it would enable the Forest Department to deliver for use on the Railway.

Neemuch-Nasirabad Railway. The charge of the Neemuch-Nasirabad Railway was transferred to the Government of Bombay on 1st November 1880, Mr. W. B. Carter being Engineer-in-Chief.

The following is a description of the works in progress during the year 1880-81:—

First Division, 44 miles.—Of this division, 33¾ miles, from Neemuch to Chittor, were opened for traffic on 10th March 1881, the line being complete and stations (except Satkunda) practically so. It forms an important section, with some comparatively heavy work in bridging. The rest of the division, not yet opened, is in a forward state, all bridging practically finished, except flood-openings to the Berach, which are well in hand, and the Berach bridge, 4 spans of 100 feet, the founds of which are complete and masonry commenced.

Second Division, 36 miles.—On this division progress was most satisfactory; earthwork nearly completed; minor bridging also; major bridging well advanced, except at the Banas, 13 spans of 100 feet, where the foundations proving deeper and more troublesome than anticipated, delay resulted from various causes connected therewith.

Third Division, 54½ miles.—The progress on this division, third subdivision and earthwork throughout excepted, was not satisfactory up to 31st December 1880. This was partly due to scarcity of stone, to the employment on part of the line of an inefficient and careless European petty contractor, and to other local causes. Arrangements were made early in January for facilitating and expediting the progress of masonry, and leading stone by train was resorted to. Since then progress has been all that could be desired.

Platelaying from the Neemuch end was finished on 12th May 1881, and would have been so from the Nasirabad end, making the line complete throughout prior to 15th May, if permanent-way had been delivered according to requirements at Nasirabad. At the Neemuch end

there are 2 engines, 65 wagons, and 2 brake-vans in use; and at the Nasirabad end 2 engines, 41 wagons, and 2 brake-vans. On the approach of the monsoon all construction train-running between Chittor and Nasirabad will cease, and the line be made fit for the passage of flood water.

It has only been found necessary to introduce a few minor diversions, which will be lifted before 15th November 1881, those of importance at the Berach, Banas, Kothari, Mansi, and Khari rivers remaining in till the bridges over these rivers are finished.

Sindia Railway.

The progress of the gap in the Sindia line, which is still under construction at the Chambal river, is shown by the following extracts from the Annual Progress Report for 1880-81. The bridge and approaches, 8¼ miles, have since been completed and were opened to traffic on the 15th May 1881, the whole line from Agra to Gwalior being now worked by the East Indian Railway Company.—

Chambal Bridge.

Earthwork.—The heavy banks north and south of the Chambal bridge were rapidly pushed on and wellnigh completed when the year closed.

Bridgework: Minor bridges.—All the minor bridges and culverts are finished, as stated in previous reports.

Large bridges.—Chambal Bridge—2 spans of 150 feet and 12 spans of 200 feet.

Before the commencement of the year.	*At the end of the year.*
First 7 spans completed, including erection of girders. Nos. 8 and 9 piers were raised to upper ashlar level. No. 10 pier was raised 66 feet high from lower ashlar platform. No. 11 pier was raised 21 feet high from lower ashlar platform. No. 12 corbelling was finished to lower ashlar platform. No. 13 sinking was nearly finished. South abutment—About 8 feet of corbelling done.	All the spans completed, with the exception of the girders for the spans from pier No. 13 to south abutment, which were in course of erection when the year closed.

Koari Bridge—3 spans of 100 feet and 2 spans of 40 feet, finished.

Asun Bridge—3 spans of 100 feet, finished.

Sank Bridge—3 spans of 100 feet, finished.

Gwalior Nala—3 spans of 40 feet, finished.

Level-crossings.—The sanctioned number of level-crossings and gate lodges finished, except one level-crossing on Chambal Diversion.

Fencing.—The line has been fenced, except the length between Dholpur and Hetampur, which is in fair progress.

Ballasting is nearly complete. A great push has been made to get it finished.

Permanent-way.—All the sidings at minor stations have been laid during the year. Rails have been laid on the Chambal bridge, and very little remained to link in the unopened section when the year closed. Some sidings remain to be finished at Gwalior station.

Stations and Buildings.—The goods-shed and engine-shed at Gwalior have been completed during the year. The pump-house at Gwalior station and the well for the use of the staff at the Morar troop-platform station have also been finished.

Expenditure.—Owing to the non-completion of works in time to admit of the final settlement of all accounts before the close of the current year, and to the sale of 30,000 sleepers to the East Indian Railway, there was a great saving over the original grant assigned for outlay in India during the year.

General remarks.—The bridge was expected to be opened by the end of March. This hope was not realised, as the erection of the water span was more difficult than was anticipated.

The work has been well carried out by Messrs. Glover and Company.

Capital Appropriation and Outlay Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ...	...	...	...	...	...	2,64,859	2,64,859	2,64,859
Land	...	10	10	...	10	20,517	20,527	20,499
Construction of line ...	7,35,000	4,79,095	4,38,049	...	4,38,049	41,80,392	46,18,441	49,20,706
Ballast and Permanent-way	1,94,000	—23,651	—23,077	...	—23,077	21,23,100	21,00,023	23,08,250
Stations and Buildings ...	12,000	39,758	33,672	485	33,187	5,86,488	6,19,675	6,31,404
Total Construction Accounts	9,41,000	4,95,212	4,48,654	485	4,48,169	71,75,356	76,23,525	81,45,718
Plant ...	5,000	4,582	4,661	...	4,661	31,085	35,746	37,655
Steam Ferries ...	...	...	...	...	...	...	...	...
Rolling Stock ...	97,000	17,091	17,091	...	17,091	97,957	1,15,048	2,00,000
Establishment ...	76,234	57,409	45,369	15	45,354	4,99,297	5,44,651	6,59,546
Total Expenditure on Final Heads ...	11,19,234	5,74,294	5,15,775	500	5,15,275	78,03,695	83,18,970	90,42,919
Suspense Accounts ...	—1,19,000	2,811	14,149	...	14,149	7,189	21,338	...
Grand Total Expenditure	10,00,234	5,77,105	5,29,924	500	5,29,424	78,10,884	83,40,308	...

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Incorporated Local Funds.	Foreign Funds.	Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
During the year ...	4,99,066	...	...	...	...	...	4,99,066
To close of the year ...	67,07,472	...	1,70,917	...	...	...	68,78,389

Bombay Eastern Deccan Railway.

The line* has been finally surveyed and staked out from Bijapur to Bhagalkot, the earthwork on the section from Hotgi to Bijapur having been nearly completed as a famine work in the year 1879. The country between Bijapur and Bhagalkot is somewhat difficult; and the Executive Engineer's approximate estimates are—

* Administration Report of the Railway Department, Bombay Presidency, for 1880-81.

	Miles.	Rs. per mile.
For a fair-weather line—		
Hotgi-Bijapur	59	37,516
Bijapur-Bhagalkot	56½	48,143
For a finished line—		
Hotgi-Bijapur	...	70,767
Bijapur-Bhagalkot	...	86,271

the above being for a railway on the metre gauge.

The detailed design and estimates for the bridges have still to be worked out. It will probably be considered advisable to construct the fair-weather line first, and proceed with the bridges and permanent buildings as funds can be provided.

As there is little hope of the line earning, in ordinary years, sufficient to pay the interest on capital outlay, economy should be studied in every possible way; and as rapid construction generally conduces to economy, it is hoped that, whenever it is decided to undertake this Railway, sufficient funds will be provided to complete it, as a fair-weather line, within the first year.

There will be no difficulty as regards the Bijapur Section, the earthwork being already nearly done; but the Bagalkot Section will be a much heavier task, as will be evident from an inspection of the section.

Barsi Survey.

The necessary funds for the Barsi surveys were supplied from Provincial revenues.

A favorable line has been obtained. It is 33 miles long, starting from the Great Indian Peninsula Railway station at Barsi Road and terminating at the Bhima river, the town of Pandharpur being situated on the opposite bank of the river. The approximate estimate of the

Executive Engineer, for a line on the 5′ 6″ gauge of first class construction, similar to the Dhond and Manmad Railway, amounts to Rs. 15,52,877, or Rs. 47,057 a mile, exclusive of rolling stock; but this estimate can be considerably reduced by the use of second-hand permanent-way materials, and dispensing, for the present, with permanent buildings. The project has not yet been reported on by the Consulting Engineer, as it is the intention to submit it at the same time as that for the Barsi Road, Barsi Branch, which is under preparation.

To bridge the Bhima and take the line into Pandharpur would add some five lakhs to the estimate; and this work must, in any case, be deferred.

CENTRAL PROVINCES.

Nagpur and Chhattisgarh Railway.

On the 6th April 1880 the line was opened between Nagpur and Tumsar, 53 miles, for goods traffic only, there being no vehicles available for the transport of passengers. It was subsequently opened for passenger traffic as under:—

	Miles.	Date of opening.
Nagpur to Kampti	9	26th July 1880
Kampti to Tumsar	44	8th November 1880

Since the close of the official year the line has been opened for general traffic to Amgaon, 81st mile.

Construction works were pushed on on the unopen line, and by the end of the year a total of 88 miles of rails were laid, including a temporary diversion across the Wain Ganga river.

Difficulties were experienced in obtaining a sufficient amount of sleepers and in carrying out the works in the tunnels at Darakussa, owing to the hard and fissured nature of the rock.

Extension survey.

An extension survey was made from Dongargarh, the terminus of the line, to Raipur (62 miles) *vid* Nandgaon (19 miles). The construction of the section to Nandgaon was subsequently commenced.

The survey from Nandgaon to Raipur was further extended to Bilaspur, and is nearly completed.

The question of the extension of the Nagpur and Chhattisgarh line to join the Bengal system of railways is under consideration.

The following extracts from the Central Provinces Administration Report supply information regarding the progress made on the construction works during the year:—

The line and station buildings, &c., were yet incomplete in details, and one bridge of three spans of 60 feet had still to be finished.

In the 2nd Division, extending from 51st to 94th mile, the works generally were half completed; and in the 3rd Division, or from 94th to 126th mile, about one-fourth was completed.

On the Wain Ganga bridge in the 2nd Division, the largest work on the line, one abutment was founded, and in two piers the masonry was brought up to near bed-level.

On the tunnel only 39 feet of headway were driven.

A grant of 20 lakhs was made by the Government of India for expenditure during 1880-81.

Of this sum, Rs. 1,48,300 had to be set aside on account of the previous year's grant having been exceeded by that amount.

The balance available was allotted with a view to opening up portions of the line as soon as possible.

The total expenditure on final heads during the year amounted to Rs. 26,28,486.

The total expenditure on final heads to the end of the year amounted to Rs. 54,39,860, and the debit to Suspense Account stood at Rs. 4,25,615, this head having been reduced during the year by Rs. 5,84,459.

The following statement shows the grants and outlay incurred in connection with the line up to the 31st March last:—

Main heads of expenditure.	Official year, 1880-81. Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.	Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ...	...	...	...	...	...	2,13,216	2,13,216	2,13,200
Land ...	10,000	5,000	177	5	172	9,029	9,201	35,700
Construction of line ...	9,51,000	8,59,900	10,00,103	1,503	9,98,600	9,09,085	19,07,685	28,80,100
Ballast and Permanent-way ...	5,10,000	5,00,000	3,91,517	...	3,91,517	9,84,285	13,75,802	20,46,200
Stations and Buildings ...	2,00,000	3,15,750	2,76,387	237	2,76,150	2,77,789	5,53,939	9,99,500
Total Construction Accounts ...	16,71,000	16,80,650	16,68,184	1,745	16,66,439	23,93,404	40,59,843	61,74,700
Plant ...	1,16,000	88,950	99,802	37	99,765	96,866	1,96,631	3,79,700
Rolling Stock ...	2,92,000	5,31,500	6,73,408	12	6,73,396	34,971	7,08,367	9,80,000
Establishment ...	1,80,000	1,83,900	1,88,990	104	1,88,886	2,86,133	4,75,019	6,00,200
Total Expenditure on Final Heads ...	22,59,000	25,35,000	26,30,384	1,898	26,28,486	28,11,374	54,39,860	81,34,600
Suspense Accounts ...	—89,000	—5,30,000	—5,84,459	...	—5,84,459	10,10,074	4,25,615	...
Grand Total Expenditure	21,70,000	20,05,000	20,45,925	1,898	20,44,027	38,21,448	58,65,475	81,34,600

MADRAS.

South Indian Railway.

In Madras 21 miles have been added to the open mileage, the following extensions on the South Indian Railway having been opened during the year :—

	Miles.	Date of opening.
Chingleput to Walajabad	13	1st August 1880
Walajabad to Conjeveram	8	1st January 1881

Gingee Bridge.

The bridge over the Gingee river on the Pondicherry Branch, consisting of seven openings of 150 feet, is approaching completion. The girders are of the Whipple-Murphy type, and are similar to those in the other large bridges on the South Indian Railway, except that the struts are braced with lattice bars instead of plates. The temporary way was destroyed by floods, and work at the bridge generally delayed in November 1880. A thoroughly effective flooring is being put in here. Floors are also being added to all works in the Tanjore delta and to others which are not founded on rock, or which show signs of scour.

On the Chingleput-Conjeveram line the bridge of two 120-feet openings near Chingleput is in progress, as well as the new stations at Conjeveram and Arconum, and the goods-shed at the former place. The arrangements for supplying Trichinopoly and Tuticorin with better rates for locomotives have been completed.

Madura-Paumben Extension.

A survey has been made for 48 miles for a line, designed as a protective work, running from Madura south of the Vaigai river through Ramnad to Kilakarai. The line would probably run along the existing road for 21 miles out from Madura, and its total length would be 93 miles.

Proposals were also made by private companies for the construction of the two following extensions on the Madras Railway:—

(1) From Metapaliyam to Coonoor.

(2) From Shoranur to Cochin.

Nilgiri-Rigi Railway Company.

The proposals for a line from Metapaliyam on the Madras Railway to Coonoor in the Nilgiri hills was started in Madras by Messrs. Stanes and Company as secretaries and treasurers. It is on a narrow gauge from Metapaliyam to Kullar at the foot of the Nilgiris, a distance of 5½ miles, and runs thence at an average gradient of 1 in 8 up the Coonoor Ghat, a distance of 6½ miles, an intermediate rack rail on the Rigi rail system being introduced on this Ghat section. The undertaking, it was considered, would develop the resources of the Nilgiri plateau, where the production of tea, coffee, and cinchona is gradually increasing, and would increase the traffic on the Madras Railway, and thereby diminish the subsidy which has now to be made good by the Imperial Exchequer; and permission has been given to the Agents of the Company to open out the trace of the line to a width of 3 feet between Kullar and Coonoor through Government waste land.

The Company, however, having subsequently asked for a Government guarantee of 4 per cent. on £150,000 for twenty years, the matter is still under consideration.

Cochin and Travancore Railway Company.

The projected line from Shoranur to Cochin, 59¼ miles, is on the broad gauge. Its construction is proposed by an English Company, styled the Cochin and Travancore Railway Company Limited, at a cost of 66 lakhs of rupees; and the Madras Government proposed to give the promoters a guarantee of 4 per cent. on that sum for a period of fifteen years, as under:—

The Cochin State to guarantee	...	...	2 per cent.
The Travancore State	...	...	1½ „
The Government of India	...	...	½ „

The project was under consideration by the Government of India when alternative lines were proposed by Sir T. Madhava Rao, K.C.S.I., and further information is now awaited.

BURMA.

Rangoon and Sittang Valley Railway.

In Burma the construction of the line from Rangoon to Toungoo, or the Rangoon and Sittang Valley line as it is sometimes called, was sanctioned. A brief statement of the objects to be gained by the construction of this Railway has been given in Chapter I, and need not be recapitulated here.

Rangoon and Irrawaddy Valley Railway.

The existing line from Rangoon to Prome was consolidated and improved. The suburban lines in the immediate neighbourhood of Rangoon were completed. On the main line additional waterway was provided, new sidings were put in to increase the accommodation, and additional staff quarters provided.

The following extracts from the Burma Administration Report for the year give further information as to the state of the works at the end of March 1881:—

	Rs.
The Capital grant for 1880-81 for main and suburban lines amounted to	1,60,000
And the expenditure against the grant was on main lines and suburban lines	1,51,833

The suburban lines were finished during the year, and all capital expenditure on the original estimate ceased from 1st January 1881. A new estimate for an extension of No. 2 line for a distance of 1,500 feet to Messrs. Ainslie, Warren's Mill, Daneedaw, was put in hand.

The progress in works was as follows:—

Land.—On the main line 1½ acres of land were taken up north-west of Kemmendine station to provide room for a goods platform and yard and additional goods sidings.

Also nearly one acre of town land at Letpadan at north-west end of station taken up to provide room for out-buildings to guards' running-room.

Minor bridges.—The two bridges (each 2 spans of 12 feet) begun last year to provide additional waterway at miles 41½ and 128½ were completed before the rains of 1880; also a brick and iron girder bridge, 40′ span, built to replace an unsafe wooden bridge at 116¾ miles.

The following brick bridges were put in hand to replace unsafe wooden bridges:—

No. 80, at 32 miles, one span of 40′; foundations excavated; concrete begun.
„ 104, at 40½ miles, arched culvert 6½′; materials at site; excavation in hand.
„ 141, at 53¼ miles, one span of 10′ for double road; nine-tenths completed.
„ 188, at 70½ miles, arched culvert 6½′; materials being collected.
„ 201, at 73¾ miles, one span of 40′; materials being collected.
„ 209, at 76¼ miles, arched culvert 6½′; materials being collected.
„ 211, at 76½ miles, one span of 40′; materials at site; excavation in progress.
„ 213, at 77 miles, open culvert 6½′; materials at site; excavation in progress
„ 219, at 79½ miles, one span of 12′; founds excavated; concrete in progress.
„ 256, at 90¾ miles, three spans of 40′; materials at site; abutments in work in progress.
„ 305 at 105 miles, one span of 30′; materials at site; work in progress.
„ 314 at 107½ „ 20′ „ „
„ 317 at 108¼ „ 20′ „ „
„ 337 at 114½ „ 20′ „ „
„ 340 at 114¾ „ 20′ „ „
„ 365 at 121¼ „ 20′ „ „
„ 367 at 121½ „ 20′ „ „

The bridging of the suburban lines was completed.

Fencing.

600′ new fencing constructed at Palone station.
3,600′ old „ moved to new limits of ditto.
60′ new „ constructed at Kemmendine station.
850′ old „ moved to new limits of ditto.
405,000 cubic feet earthwork executed in completing fence bank between 93rd and 149th miles.

Ballast.

Laterite ballast—

1,000	cubic feet	issued	to carriage shed roads, Rangoon; completed.
16,440	„		to Kemmendine goods yard sidings } nearly com-
18,600	„		to Insein shop-yard sidings } pleted.
9,000	„		to Palone station new sidings; half completed.
11,520	„		to suburban lines; completed.
56,560			

Besides the above, 702,200 cubic feet of laterite was quarried at the Wanet stream quarry, of which—

211,360 cubic feet were issued to the Rangoon Municipality and the Public Works Department.

266,710 ,, were issued for revenue works and maintenance of permanent-way.

224,130 ,, were left on hand at quarry.

A large demand for this laterite has sprung up in Rangoon for metalling purposes, and it is proposed to quarry and deliver about 12 lakhs of cubic feet in the ensuing season. It has been necessary to provide additional siding accommodation at Wanet stream, and more open trucks are required for this traffic, which gives a very acceptable addition to the traffic receipts in the slack season.

Rolling stock.—Stock completed during the year was—

32 short covered goods.

2 powder vans.

2 plank wagons.

The increase in the goods traffic has been so rapid, that it has been considered necessary to indent for five new F class locomotives and underframes for—

220 short-covered goods wagons,

20 cattle trucks (high-sided wagons), and

50 iron open trucks (low-sided wagons), complete.

NATIVE STATES.

The following extracts have been made from the Progress and Administration Report of Central India for the year 1880-81:—

Bhopal Railway.

The preliminary project for the line from Itarsi to Bhopal and Sehore (on both 5′ 6″ and metre gauges) was submitted at the beginning of April 1880. The staking out of the line to Bhopal and Sehore, which had been begun in January, was finished in May; and during June and July the working sections and plans were prepared. In the last named month orders were received to invite tenders on schedules of rates for the construction of the line in four sections as far as Bhopal only on the 5′ 6″ gauge. The working drawings were accordingly completed as far as possible by the middle of August, when advertisements inviting tenders were inserted in the public prints.

At the end of September the tenders were received, and in October an abstract of the tenders, with various proposals, was submitted to Government. Orders were received late in October, and negotiations were opened with Messrs. Glover and Company for the construction of the whole line to Bhopal (excluding the supply of ironwork for bridges, permanent-way, and other materials usually ordered from England), which resulted in the settlement of a contract on a schedule of rates amounting approximately to Rs. 30¼ lakhs.

Work was commenced on the 23rd November. On the 31st March the progress made was as follows:—

	Percentage executed.
Whole contract	10
Earthwork	17
Nerbudda Bridge	2·6
Gudariya Viaduct	2·7
Other bridges	3
Ballasting	3
Stations and offices	3
Station machinery	7
The above earthwork consists of soil banks and cuttings ...	30
Cuttings on Ghat	16
Banks on Ghat	9

At the Nerbudda bridge the masonry of 2 piers had been begun; the foundations of other piers were well forward, and a fair supply of stone in hand. The progress in bridgework generally shows somewhat smaller than it really is, as foundations down to water level are not paid for, and the progress is calculated from the amount of the contractor's certificates.

For construction purposes the line is divided into two divisions, each under an Executive with 2 Assistants under him. There is also a Sub-Engineer on the Nerbudda Division, who acts as an Inspector of Masonry. All disbursements are made by the Engineer-in-Chief. The Executive send in monthly measurements, from which the certificate is made out in the Engineer-in-Chief's office. The accounts are compiled by the Examiner of Accounts, Central India.

Extension Surveys.—Late in October 1880 orders were received to survey an extension of the Bhopal line to Jhansi, with a branch to Saugor. About 104 miles of this line had been located, when on February 8th orders were received to stop the field work at once, and to send the staff to Pachmarhi, to plot the work as far as done. The line surveyed passes through Bhelsa Basoda, Udepur, Pathari Khorye, and Lulloe to the Muddunpur pass, whence to Jhansi it has been reconnoitred by the Engineer-in-Chief, Sindia Railway.

An alternative line, leaving the above line at Basoda, has been also reconnoitred by the same officer.

The following extracts from the Administration Report of the Railway Department, Bombay, supply information as to the development of the Bhavnagar-Gondal line and the Gaekwar of Baroda's Railway :—

Kathiawar or Bhavnagar-Gondal Railway.

The section of the Railway from Bhavnagar to Wadhwan was opened for traffic by His Excellency the Governor of Bombay on the 20th December 1880; and the remainder from Dhola to Dhoraji on the 19th January 1881.

The rivers were then all unbridged, the line being taken across them by means of diversions; but considerable progress has since been made with the bridging on the line between Bhavnagar and Dhoraji, and a commencement has been made between Dhola and Wadhwan. The bridges between Bhavnagar and Dhoraji will be finished before the heavy rains set in in July, and it is proposed to keep the Dhola-Wadhwan section open till the river floods render the diversions impassable.

The general progress of the works during the past year is as follows :—

Earthwork.—The greater portion of earthwork was practically completed last year, except at bridge approaches. A considerable quantity has since been done in making up new banks, bridge approaches, station sidings, and repairing slopes.

Diversions.—In April last year all the diversions were ready except the Ghela in the Bhavnagar Division. The rock-cutting here proved to be so difficult, that the river was crossed by a bank 7 feet high; but this was washed away during the monsoon, and the cutting has now been lowered, so that there is only a 2 feet bank across the river. During last year's rains considerable damage was done to the line by floods, between miles 45 and 48; and, from observations of the flood discharges, it has been found necessary to add to the waterway at the Ghela bridge, and to raise the formation level at the Limbdi and Ranpur stations, as well as the approaches to the Ranpur bridge.

Bridging.—On the Bhavnagar Division five minor bridges are nearly complete and fourteen major bridges are well in hand. On the Gondal Division the arches of all minor bridges have been turned, and good progress has been made on the seven large bridges, all of which consist of masonry arches of 20 and 40 feet spans, the number of arches in each bridge varying from 1 to 16. On the Botad Division quarries have been started, and some foundations put in.

Ballasting.—The first 36 miles in the Bhavnagar Division has been ballasted, and the remaining 30 miles will be ballasted by train during the ensuing monsoon. On the Botad Division seven-tenths of the permanent ballasting have been completed, and on the Gondal Division three-tenths.

Stations and Buildings.—A temporary station has been built at Bhavnagar city, and staff quarters and offices have been provided at Gadechi, Wadhwan, and other places. The workshop accommodation and fittings at Gadechi have been increased. The engine shed at Dhola is complete, and an engine shed and six ashpits have been built during the year at Wadhwan city and at Dhoraji. Turntables have also been erected at the two latter stations and at Gadechi.

Rolling stock.—During the year eleven engines were received from England and fitted up in the Gadechi workshops, and are in running order.

The following carriages and wagons have been built:—

55 third class carriages.
8 second „ „
4 first „ „
100 covered goods wagons.
275 low-sided wagons.
15 brake-vans.

Also two 10-ton cranes were received and fitted up during the year.

Traffic.—The total earnings and expenditure from date of opening up to 31st March were Rs. 1,31,008 and Rs. 1,03,094 respectively. The train mileage run was 61,603, which gives the cost per train-mile Rs. 1·68.

During the months of April and May of the present year the earnings per open mile per week have reached Rs. 137—a result which is very satisfactory, considering the short time the line has been open.

Gaekwar of Baroda's Railway.

The line from Goa gate, Baroda, to Dabhoi was opened on the 1st Ju'y 1880, and from Goa gate to Vishwamintri, 1¾ miles south of the Baroda station of the Bombay, Baroda and Central India Railway Company, on 24th January 1881.

The work of these lines continues to give satisfactory results. During the whole year 1880 the net revenue gave a return of 7·31 per cent. on the capital expended.

It has been proposed that the electric telegraph should be erected along these lines to facilitate working. At present they are worked on the staff and ticket system. The Baroda Administration has not yet determined on the change.

Among the lines which the Durbar have it in contemplation to construct on the 2′ 6″ gauge hereafter may be mentioned—

(1) a line from Anand to Pitland and Pipolo;

(2) lines from Meysana on the Rajputana Railway to Patan and Kherala.

The success of these small lines, as a substitute for roads in Guzerat, where, owing to the absence of stone, the construction and maintenance of metalled roads are costly, has been so marked, that the Bombay Government are considering the expediency of making a line on this gauge from Jambusa to Broach, utilising the present road for the purpose. The amount of traffic on this line is known, and no great development is to be looked for; and as a line on the 2′ 6″ gauge will carry the traffic, there is no reason against its adoption. The same remark will apply in other cases where short lines are required, as feeders to the main line of the Bombay, Baroda and Central India Railway, in Guzerat; and as the rolling stock is light, and can be transferred from place to place without difficulty by the Baroda Railway, it may be possible to overcome in great measure the objection which exists to the construction of short branches on a different gauge to that of the parent line, that each requires to maintain a special stock to meet the maximum demand.

Khamgaon and Amraoti Railway.

Worked by the Great Indian Peninsula Railway Company. See Chapter IV.

The Nizam's Railway.

Open Line. See Chapter IV.

Mysore Railway.

The following extracts from the Annual Progress and Administration Report of the Mysore State Railway for the year 1880-81 show the state of the works at the end of the year and the progress made:—

The original budget grant for the year 1880-81, Rs. 15,00,000, was increased in the regular estimate to Rs. 15,85,500.

The net outlay during the official year amounted to Rs. 15,57,253 after crediting a payment of Rs. 52,881-7-9 from the Madras Railway Company on account of the Pettah extension.

This extension (broad gauge) was transferred to the Madras Railway Company on 1st October 1880, free of cost, up to formation level.

On 1st February 1881 the section between Bangalore and Channapatna (35 miles) was opened to traffic; and on 20th March 1881, at the time of the installation, a further length of 23 miles as far as Mandya was opened for passenger traffic.

As regards progress of the line under construction beyond Mandya—

Earthwork was completed, with the exception of the gaps near bridges.

Minor bridges.—Nearly five-sixths were completed.

Major bridges.—On the open line as far as Mandya the temporary bridge over Mallur river was in use, and the road bridges already existing at the Shimsha and Hebbala rivers were converted into railway crossings at a small cost; and on the unopen line between Mandya and Mysore the foundations of all large bridges were filled in and superstructure fairly advanced.

Ballasting of the first 25 miles was fully completed, and from 26 to 46 miles nearly completed, during the official year. The line from the 47th mile to Mandya was partially ballasted. On the whole, two-thirds of the work had been completed under this head.

Permanent-way material and stores.—The delivery of 60 miles indented for in 1879-80 had been nearly completed. The final indent for complete equipment of the line was forwarded by the Government of India to the Secretary of State under despatch No. 147 of 19th October 1880.

In December 1880 permanent-way materal sufficient for about 9½ miles was received from Bombay, and a second consignment of about 30 miles of permanent-way materials was received in Madras from Kurrachee at end of official year.

Station Buildings.—Fair progress had been made, and sufficient for traffic purposes had been completed.

Locomotive Carriage and Wagon stock.—A supplementary indent for 10 locomotive engines of a powerful type was also submitted, as the tank engines, class A, supplied under first indent were found to be unsuitable for the grades and curves of the line.

Two first class, one composite, two second class, and fourteen third class carriages, four brake vans, five covered goods, fifty-five low-sided, and four high-sided wagons, were erected.

CHAPTER IV.

OPEN LINE.

PUNJAB AND SIND.—*Punjab Northern Railway*—Main line opened to traffic in an incomplete state owing to military exigencies—Difficulties of working the line—Proposed flattening of grades to 1 in 100—Rahtial to Rawalpindi—Rawalpindi to Haji Shah—Traffic—Coal—Working expenses—Development of traffic—Capital expenditure—Engineering works—Lahore to Jhelum—Jhelum to Missa—Missa to Haji Shah—Missa to Rawalpindi—Rawalpindi to Haji Shah—Workshops and staff quarters—Salt Branch—Locomotive and Carriage and Wagon Departments.—*Indus Valley Railway*—Extensions opened—War traffic—The Railway invaluable as a means of transport—Extension of main line and branches—Details of working. NORTH-WESTERN PROVINCES AND OUDH.—*Muttra-Hathras Railway—Cawnpore and Farukhabad Railway—Ghazipur-Dildarnagar Railway—Muttra-Achneyra Railway.* BENGAL.—*Northern Bengal Railway—Tirhoot Railway*—Extensions to Bettiah and Pipra Ghat—Muzaffarpur-Hajipur Project.—*Patna and Gya Railway—Calcutta and South-Eastern Railway—Nalhati Railway.* BOMBAY AND CENTRAL INDIA.—*Rajputana Railway*—Opened for through traffic on 1st January 1881—Junction with Bombay, Baroda and Central India line—Traffic.—*Malwa Railway—Sindia Railway—Dhond and Manmad Railway.* CENTRAL PROVINCES.—*Wardha Coal Railway—Nagpur and Chhattisgarh Railway.* BRITISH BURMA.—*Rangoon and Irrawaddy Valley Railway.* ASSAM. NATIVE STATES.—*Bhopal Railway—Bhavnagar-Gondal Railway—Gaekwar of Baroda's Railway—Khamgaon and Amraoti Railways—Nizam's Railway—Mysore Railway.* EAST INDIAN RAILWAY. GUARANTEED RAILWAYS.—*Sind, Punjab and Delhi Railway—Oudh and Rohilkhand Railway—Eastern Bengal Railway—Great Indian Peninsula Railway—Bombay, Baroda and Central India Railway—Madras Railway—South Indian Railway.*

PUNJAB AND SIND.

Punjab Northern Railway.

At the end of 1879 the Punjab Northern Railway was opened as far as Jhelum: 180 additional miles were opened between the 1st January 1880 and the 1st January 1881, *viz.*,—

		Miles.	Date of opening.
Main line—			
Jhelum to Rahtial	... ...	14¾	1st January 1880
Rahtial to Rawalpindi	... ...	53	1st October 1880
Rawalpindi to Haji Shah	... ...	58	1st January 1881
Salt Branch—			
Lala Musa to Bhaodin	... ...	28½	1st January 1880
Bhaodin to Hurriah	... ...	10	1st February 1880
Hurriah to Miani	... ...	15½	10th April 1881

Since the 1st January 1881 the following extensions have been opened:—

		Miles.	Date of opening.
Main line—			
Haji Shah to Attock	... ...	5	5th April 1881
Pindi Kohat Branch—			
Tarnaul to Langar	... ...	58½	1st April 1881
Langar to Khushalgarh	.. ...	8¾	5th April 1881

Main line opened to traffic in an incomplete state owing to military exigencies.

The difficulties experienced in the construction of the main line have been set forth in the preceding chapter. The exigencies of military traffic imperatively demanded that no delay should occur in opening each section as soon as an engine could run over it; and the line was consequently thrown open for traffic before the road was thoroughly formed and consolidated, and a portion of it ran over temporary diversions where the severity of the gradients, the sharpness of the curves, and the hurriedly finished state of the works rendered the management of the open line a matter of extreme difficulty.

Thus between Rahtial and Rawalpindi there are 37 miles of road on gradients steeper than 1 in 100; between Rawalpindi and Haji Shah there are 14 such miles. A proposal has been under consideration to flatten these grades throughout the line, leaving the ruling gradient at 1 in 100. It has been estimated that for 10 lakhs of rupees this could be effected, with the exception of two lengths (one of 3 miles and the other of 5 miles), which would be worked as Ghat sections by special bank engines, as is done in the Ghats near Bombay. The development of the traffic is awaited before deciding on this outlay.

Difficulties of working the line.

Proposed flattening of grades to 1 in 100.

The following extracts from the Administration Report of the Manager for the year show more fully the difficulties under which the working has to contend:—

Rahtial to Rawalpindi.

The section Rahtial to Rawalpindi is mostly on the permanent line, with the exception of a diversion to get round the Rahtial ravines, where very heavy banks and cuttings are still in progress. This diversion is a very awkward one, and necessitates a reversing station. This entailed trains being worked on this section by engines in front and rear of the train, or trains with single engines had to run tender foremost between Jhelum and Rahtial. Both these systems were found so objectionable, that a triangle was put in at Rahtial on which all engines are now turned.

This section, though opened to traffic, was far from complete. Cuttings were not taken out to full width, banks fully made up, side drains put in; it was only partly ballasted, and the stations and watering arrangements were in a very incomplete state. Much was, however, done to improve matters by close of financial year.

The principal feature in this section is the extremely difficult grades, there being no less than 37 miles of grades less than 1 in 100 on it, 1 in 50 being the steepest—

	Feet.
1 in 80—99	10,700
1 in 70—79	62,800
1 in 60—69	65,000
1 in 50—59	57,900
Total ...	196,400

The difficulty is further increased by the grades not being in one direction, but alternately up and down.

At Rawalpindi no station was built when the line was opened. A temporary one has been constructed; but it is far too small for the large passenger traffic, and will have to be replaced next year by a larger and improved structure.

Rawalpindi to Haji Shah.

This section was opened to traffic on the 1st January 1881, in much the same state as the abovementioned section; only here the line runs for several miles on a temporary formation, in some places on the Grand Trunk Road.

The grades and curves at the Margalla pass, Kala-ki-Serai, and Harro diversions of 1 in 40 and 1,000 feet radius are most difficult and dangerous to work. Much of the temporary line is unballasted, and the working of this section has been a constant source of anxiety to all concerned.

On this section there are about 14 miles of less than 1 in 100—

	Feet.
1 in 90—99	6,000
1 in 70—79	19,700
1 in 60—69	16,900
1 in 50—59	14,500
1 in 40—50	17,300
Total ...	74,400

Here, too, the stations and other appliances were in an even more incomplete state than on the Jhelum-Pindi Section.

Traffic.

Nor were these all the drawbacks imposed upon the open line. In addition to the heavy military traffic, caused by the occupation of Northern Afghanistan during the greater part of the year and by the return of our troops in the autumn, a large amount of railway construction material had to be carried for the Attock-Peshawar and Rawalpindi-Khushalgarh Extensions.

The traffic carried during the year 1880 has been very large and surpassed all expectations. Of course, in the early months of the year it was caused by the Afghan war and by the quantity of material being pushed forward for construction. At the close of the calendar year, the Viceroy's Durbar at Lahore gave a great impetus to passenger traffic, and owing to scarcity in the northern parts of the Punjab there was a great rush of grain traffic. The line at that time was quite insufficiently supplied with engine-power to meet this demand, many of the engines on the line being nearly worn out from constant work and want of repairs. Engines worth having could not be obtained from other railways; and though endeavours were made to choke off the traffic by raising the rates, the traffic still poured in, and it was ultimately necessary to suspend through booking; and this was not finally resumed till June 1881, by which time the Railway was sufficiently supplied with engines to enable it to undertake to carry all traffic offering.

The loss of receipts owing to this cause was very considerable; but, with a line half stocked with engines, much of it completely unfinished, and a new and untrained staff, it was unavoidable.

Coal.

The heavy working expenses were also a source of embarrassment to the management. The Bengal coal, the price of which is Rs. 3 a ton delivered into the East Indian Railway wagons at Giridi, costs over Rs. 30 a ton by the time that it is delivered at Lahore. Every effort was, therefore, made to utilise the Punjab coal found in the Salt Range near Pind Dadan Khan. The experiments made show that "the coal itself is of inferior quality; and it has not yet been obtained in sufficient quantities to enable us to judge whether it will pay to use it, or whether the supply is likely to be of a more than temporary nature."

Working expenses.

Wood fuel was also used as much as possible, in order to economise under this head. War prices, too, kept up the price of labour.

Another cause of high expenditure is owing to the unfinished state of the line. The charge for maintenance and engineering establishments are very high; the cost of training works for the Chenab, which hitherto has been all thrown on Revenue, is a heavy drain, about Rs. 80,000 having been spent during the year; wages are excessive, and it appears most difficult to obtain respectable men to fill the posts of station-masters, &c., even on good salaries; whilst the price of fuel and heavy grades will always keep locomotive expenses up to a high figure.

As a set-off against these drawbacks—

it may be noted that the coaching traffic promises very well. The passenger fares during the year were—

3 pies by mail.
2 „ by local.
1½ „ on Salt Branch.

Development of traffic.

The fares have since been altered to 2½ pies mixed and 2 pies local on main line, 2 pies on Salt Branch; but it is probable that a uniform rate of 2½ pies throughout, with return tickets from large stations on special occasions, would be the best paying fare to adopt. The people appear well-to-do, the rate of wages is high, and a 2½-pie rate is probably not beyond their means.

The numbers of passengers carried and receipts were as follows:—

	No.		Rs.	Rs.	Rs.
Coaching—					
1st class	6,051	...	34,407		
2nd „	24,478	...	60,258		
3rd „	1,890,769	...	8,97,182		
	1,921,298	...	9,91,847		
Miscellaneous	...		1,66,553		
				11,58,400	
Goods—					
379,120 tons carried	...	...	22,23,991		
Electric Telegraph	...	...	6,953		
Sundries	...	...	4,15,762		
				26,46,706	
		Grand Total	...	...	38,05,106

The expenditure was approximately as follows:—

Maintenance	...	...	...	3,65,827
Locomotive	...	...	...	12,65,413
Carriage and Wagon	...	...	...	1,14,922
Traffic	...	...	...	3,77,866
General	...	...	...	1,65,752
Special and Miscellaneous		...	...	8,05,594
	Grand Total		...	30,95,374
	Net Earnings		...	7,09,732

The earnings per open mile were—

For the year	...	...	17,781
Per week	...	...	342
Expenses per open mile—			
Per year	...	...	14,464
Per week	...	...	278
Train mileage	...	...	10,55,700
Earnings per train mile	...	...	3·6
Expenses ditto	...	...	2·9

The principal items of goods traffic were as follows:—

		Tons.	Rs.
Coal and coke	... ...	4,644	22,830
Cotton raw	... ...	1,211	19,583
Piece-goods, English	... ...	4,616	40,159
„ country	... ...	1,385	13,866
Fruits and nuts	... ...	5,037	38,604
Wheat	... ...	85,753	3,71,757
Grain and pulse	... ...	36,727	1,93,021
Other spring crops	... ...	8,865	40,264
Rice	... ...	8,940	52,310
Other rain crops	... ...	6,003	45,122
Hides	... ...	1,921	20,454
Liquors	... ...	2,723	30,966
Iron	... ...	4,080	31,808
Salt	... ...	40,804	1,48,701
Sugar	... ...	13,865	85,035
Miscellaneous stores			30,663
Railway materials	... ...	152,546	4,72,981
Miscellaneous			4,93,951
Livestock	... ...	...	56,473
Demurrage	... ...	...	15,443
		3,79,120	22,23,991

Few final deductions can be drawn from these figures, owing to the disturbing elements of the year, *viz.*, the Afghan war, inability of the line to carry traffic, new extensions, &c.; but it may be said that the traffic promises fairly well, and is far in excess of what was anticipated.

With the establishment of the new salt depôt at Lala Musa now under construction, a considerable increase of business in that commodity is anticipated.

Capital expenditure.

The capital cost of the line from Lahore to Attock to 31st March 1881 was approximately Rs. 4,53,15,762 ; Salt Branch, Rs. 19,37,627.

There is, however, very considerable expenditure to be incurred at Rawalpindi on the workshops, staff quarters, &c., and on the section from Rawalpindi to Peshawar, including the Attock bridge, so that the total capital cost of the line will be very large.

Engineering works.

The principal engineering works carried out before the line was opened for traffic have been detailed in the chapter on Construction. The line, it will be remembered, was in a very incomplete state when the exigencies of military traffic required that it should be opened ; and when trains first began to run upon the Railway, station buildings and other accessories were hardly commenced. At Rawalpindi the only shelter for passengers and station staff was provided by a few tents.

During the year these deficiencies have been supplied, and the following list shows the principal works carried out to complete the line :—

Lahore to Jhelum.

Two crossing stations were opened during the year—one at Pabi (Kariala), and the other at Punjan. These were charged to Capital.

Four flag stations, chargeable to Revenue, were put in at Kála (mile 12th), Sadhok (mile 24th), Dhillianwala (mile 33rd), and Jandialla Dhabwala (mile 56th).

Considerable progress was made with the Chenab training works during the year, on which Rs. 80,000 has been spent on a definite scheme with the undoubted effect of straightening the river.

The following is a list of the principal works carried out and in progress :—

Name of works.	Expenditure.	Remarks.
I.—COMPLETED WORKS.	Rs.	
Jhelum—		
Sub-way	10,648	The dangerous level-crossing at south end of the yard has now been closed.
Open goods-shed, 200′ × 40′ ...	8,641	Is a temporary shed of corrugated iron roofing.
20-roomed barrack	11,461	Occupied half by Locomotive and half by Traffic.
Six new staff quarters	35,171	
Refreshment-rooms, lavatory, and urinals	6,519	These have been completed. Further additions are now being made.
15-unit quarters for Native staff of Locomotive Department	4,115	
Extension of station building ...	...	
Lala Musa—		
Transfer siding	17,618	The yard is again to be altered.
Extension of station building ...	13,416	Rendered necessary from increased traffic, owing to opening of Salt Branch.
Guzerat—		
Waiting-rooms	4,312	Required for 1st and 2nd class passengers going to Lala Musa.
2-unit Baboos' quarters	2,354	
Goods-shed, 100′ × 40′	4,223	Temporary.
Punjan—		
Station, sidings, staff quarters ...	4,087	New crossing station.
Pabi—		
Station, with catch siding	1,265	New crossing station. Catch siding was opened, but has since been removed and dead end in station yard extended to be used instead of catch siding.
Goods-shed, 100′ × 40′	4,026	Temporary.
General—		
Ballasting, Lahore to Jhelum ...	31,258	Original estimate Rs. 60,000. Rs. 7,000 spent during the year. More work could not be done owing to press of traffic.
Fencing, Lahore to Jhelum ...	1,22,122	Completed.
II.—WORKS IN PROGRESS.		
Rearrangement of sidings in Jhelum yard ...	9,214	In hand in 1881-82. Allotment Rs. 6,000.
Engine-shed	27,780	In hand during 1881-82. Allotment Rs. 10,000.

Jhelum to Missa.

The length of line known as Rahtial Khuds from mile 117½ to 119 contained such heavy banks and cuttings, that it was thought better to avoid it altogether by a temporary diversion 3 miles along, starting with a back shunt at mile 117 and coming into main line again at mile 119. Public traffic is carried on now over this diversion, as the Rahtial Khuds are still under construction and will not be ready for opening till November next.

Earthwork cutting.—On 1st April 1880 none of the cuttings were complete; and a narrow gullet was through only in a few of them. The biggest cutting is at Domeli, containing 9,800,000 cubic feet, of which 1,800,000 cubic feet have been taken out since June 1880 without any interruption to traffic. The slopes have also been taken off most of the other cuttings north of Rahtial. Since June about 3,000,000 cubic feet have been done.

Banks.—Most of the banks were well up by June; but the earth in approaches to the bridges was very deficient, and also in several of the other banks, notably in that just north of tunnel. All banks have since been completed, except of course those in Rahtial Khud Section.

Grand Trunk Road crossings.—One at mile 127 by an overbridge. Grand Trunk Road was diverted and carried over a bank 13 feet high and 8 chains long, leading over the new bridge, which was done without interruption to traffic.

At mile 128½ there is a double level-crossing on Grand Trunk Road, which is a constant source of danger. It is now proposed to carry Grand Trunk Road here over a tunnel to be built in the cutting between the two crossings, as this cutting is also not safe and liable to slip.

Masonry side drains have been put into all cuttings north of Rahtial since June last, and all completed except a length of 7 chains in cutting 56, Domeli; quantity of masonry in them 206,000 cubic feet.

Culverts.—On 1st April 1880 only a few culverts were quite finished : all were completed on 1st June. Quantity of work done between April and June was about 300,000 cubic feet in masonry.

Several culverts have been placed at a high level so as to act as overflow culverts. This causes an accumulation of large quantities of water against the railway bank, the most important ones being one of 20 feet at mile 125 and another of 20 feet at mile 128½. There are also some smaller ones. The banks against which this water lies are a constant source of anxiety, and have sunk a total of 5 feet, so that the line there requires constant lifting. The water invariably leaks through under the bank; but it is hoped this will cease as the banks settle down. At mile 134½, a 6-foot culvert originally sanctioned was abandoned by order of the Consulting Engineer to Government, and a long deep cut was made to divert water direct into Bishendor river. This cut is 40 feet deep in places and very narrow, and is constantly getting blocked by slips from the sides of the cuttings, and consequently requires careful watching.

Platelaying.—Seven miles laid during April, May, and June 1880.

Ballast.—Four and half lakhs put in line since 30th September 1880.

At Rahtial, owing to back shunt, all through trains are of course reversed end for end, and the engine is also turned round. Up to February last it was the practice to run train tender first south of Rahtial; but in February 1881 a triangle was put in at Rahtial at a cost of Rs. 1,260, so that all engines now reverse there and can run engine first right through.

In March the distant signals at Rahtial were provided with lamps and a wire fixed to enable them to be worked from the station in the usual way. Prior to March a jemadar had to proceed to each signal to lower it.

Watering arrangements.—Prior to November 1880 the only watering station between Domeli and Jhelum consisted of four tanks, holding only 1,600 gallons at mile 119½. In November this was dismantled and a temporary watering station holding 4,800 gallons, consisting of 12 tanks on sleepers, was erected at mile 115 near Dina, which is now used by all goods trains. There was also a similar arrangement just north of Bakrala bridge, which was in use till October 1880, when it was dismantled. Tanks capable of containing 4,800 gallons are now to be put up here again. The only other watering station was at mile 131½, 1½ miles north of Sohawa station, consisting of tanks on sleeper pier. This was in use till December 1880, when it was dismantled.

In August a screw-pile arrangement was erected at Domeli, with tanks on it capable of containing 4,800 gallons. Water raised by a steam fire-engine from a reservoir close to station. This tank was enlarged in February so as to contain 8,000 gallons, and water is now raised by a steam winch and bucket. At a second reservoir, 13 chains north of station, a steam pump is being erected to pump through pipes to the abovementioned station tanks.

At Sohawa the station tank is of masonry, and was not quite finished till November 1880, when also 1½ miles of 5-inch pipes were laid to connect it with the supply reservoir, 1½ miles north of the station. This reservoir is fed only by rain water, obtained by damming up a nullah west of the Grand Trunk Road and 1½ miles away from the Railway, and diverting water into the reservoir through an artificial cut. This was complete in June 1880. But last monsoon the dam broke; it was re-made, and on 13th April 1881 came into use for the first time, when water in reservoir rose 6 feet in the course of four hours.

Water is now lying 32 feet deep against bank 37, but none is leaking under bank. Total depth of water here will be 45 feet before any can escape through the culvert; there will be also 40 feet water against bank 38.

There were 4,900,000 cubic feet bank, 1,600,000 cubic feet cutting, 43,000 cubic feet masonry done on this section between June last, when the work was started, and 31st March 1881. Trains should be able to get through this section in November 1881; but the work will be still far from finished on that date.

Missa to Haji Shah.

The commencement of the year saw this length in active progress. The principal heavy works carried out before the opening were the cutting at Sohan, the Sohan bridge, the Bykhan bridge, the Chablat bridge, and the Haro temporary bridge. When the line was opened to

Missa to Rawalpindi.

Pindi in October 1880, on the completion of the Sohan bridge, all the stations were in hand as far as Rawalpindi, and have since been completed, but the watering arrangements were

Rawalpindi to Haji Shah.

temporary only. The length from Rawalpindi to Haji Shah was opened on 1st January for traffic, the line being—

From Rawalpindi to Kala-ki-Serai—temporary, on Grand Trunk Road.
„ Kala-ki-Serai to Burhan—permanent.
„ Burhan to Lawrencepore—temporary, on Grand Trunk Road.
„ Lawrencepore to Campbellpore—permanent.
„ Campbellpore to Haji Shah—temporary.

The stations were all in progress at the close of the year; and those at Pindi (temporary), Campbellpore (permanent), and Haji Shah (temporary) had been furnished. The permanent line is only partially ballasted as yet on the permanent lengths; but this work is going on, together with the completion of the stations at Missa, Kala-ki-Serai, Hassan Abdal, Burhan, and Lawrencepore; also water service arrangements at Gujar Khan, Mandra, Rewat, Rawalpindi, Kala-ki-Serai, Hassan Abdal, and Burhan.

Workshops and staff quarters.

Locomotive workshops, staff quarters, and stores buildings are in course of construction at Rawalpindi, the head-quarters of the line. A Railway hospital has also been established there, the want of which was much felt.

The following are the present medical arrangements of the line, settled in communication with the Surgeon-General early in the year 1881:—

Distribution of Medical establishment on the Punjab Northern Railway.

Section of Railway.	Medical officers.	Subordinates.		Remarks.
		Assistant Surgeon.	Hospital Assistant.	
Lahore to south distant signal of Shahdara.	...	...	...	By special arrangement the sick of the Punjab Northern Railway at Lahore will be treated in the hospital of the Sind, Punjab and Delhi Railway.
South distant signal of Shahdara to left bank of Chenab.	Civil Surgeon, Gujranwala.	...	1	To be stationed at Gujranwala.
Left bank of Chenab to left bank of Jhelum and Salt Branch.	Guzerat ...	...	1	To be stationed at Lala Musa.
Left bank of Jhelum to south distant signal of Gujar Khan.	Jhelum ...	1 3rd grade	1	Assistant Surgeon at Jhelum. Hospital Assistant at Rahtial to attend cases on line from Dina to south distant signal of Gujar Khan.
South distant signal of Gujar Khan to south distant signal of Hassan Abdal and Khushalgarh Branch.	Rawalpindi	1 2nd grade	2	All to live at Rawalpindi.
South distant signal of Hassan Abdal to Attock.	Attock ...	...	1	To live at Haji Shah.
Total ...	...	2	6	

Salt Branch.

The dates of opening the several sections of the Salt Branch line have been given in the preceding paragraph. The results of its working have been most satisfactory.

The receipts up to 31st March 1881 were—

	Rs.
Coaching	53,810
Goods	1,60,584
Total ...	2,14,394
and approximate expenditure	92,318
so that it earned about 6·3 per cent on the capital expended, or	19,34,627

This for the first year, with the salt traffic still undeveloped and 3rd class coaching fares of 1½ pies only, is most satisfactory; and it is fully anticipated that this section will pay 7 and 8 per cent. on its capital.

It may be remarked that this line was constructed solely for the salt traffic, and no other traffic was expected; whereas an excellent passenger and grain traffic has developed, and the salt traffic is by no means the most considerable portion of the traffic.

A proposal has since been submitted for extending it to Bhera (10 miles), a town of over 16,000 inhabitants. The cost of this extension will be very trifling, and it will probably give a considerable increase to traffic on the branch.

In order to secure every return on the enormous capital expenditure on the main line, much of which above Jhelum runs through poor and non-productive country, every effort must be made to stimulate traffic on the lower and richer sections; and this can be done most readily by cheap extensions of this nature.

A branch for instance to Sialkot (30 miles), with its 35,000 inhabitants, and Jammu not far beyond, through a rich and easy country, can be constructed very cheaply, and will, it is anticipated, bring a large traffic to the line. This project will be shortly investigated.

Locomotive, Carriage and Wagon Department.

Engines.—On the 1st April 1880 the following engines were on the line:—

5′ 6″ gauge line—

H class engines		25
Borrowed stock.	East Indian Railway engines	9
	Bombay, Baroda and Central India Railway engines	5
	Indus Valley Railway H class engines ...	2
		41

Salt Branch line—

A class metre gauge engines	2
B „ „ „ „	2
	4

On the 31st March 1881 the stock of engines had increased as follows, while the open line was extended during the same period from 156 to 286 miles:—

5′ 6″ gauge line—

H class engines	49
Sharp, Stewart & Company's 6-wheel coupled engines ...	9
L class engines	10
	68

Salt Branch line—

A class engines	2
B „ „	6
	8

Great difficulty was experienced during the year 1880-81 in the regular supply of power for traffic owing to the inadequate number of engines available and the deficiency of accommodation and appliances for their repair. The water-supply on the Lahore-Jhelum length, owing to the insufficient capacity of station water tanks, was often a source of detention to trains; but notwithstanding these drawbacks, the engines were kept in very fair working order; and although on two or three occasions a block was imminent from the paucity of power, no serious hitch ever actually occurred, and the traffic was worked off successfully by the exertions of all concerned.

At the close of the year under notice the necessity for hiring foreign railway engines had ceased to exist, and all had then been returned to their parent lines.

The following failures of engines occurred during the year 1880-81 from the causes stated :—

Failure of injectors	28
Leaky tubes	22
Carelessness of drivers	4
Breakage of working parts	15
Derailments	58
Derangements of slide valves	19
Miscellaneous	24
	170

Thirty-six of these failures and 13 derailments occurred to borrowed foreign railway engines. A large number of derailments of engine tenders took place on the sections of the line between Jhelum and Haji Shah for some time after its opening; and these derailments at the time were attributed to the unformed state of the line, and in some cases to the fact of the engines having been running tender foremost for want of a turntable or triangle at Rawalpindi.

That the opinion formed on this point was correct is proved by the fact that derailments of engine tenders on the abovementioned section seldom or never occur now, because the line is in better condition and no necessity exists for engines running tender foremost. There can be no doubt that a larger proportion of the accidents recorded in the foregoing statement was due to the inferior stamp of drivers who were obliged to be entertained, simply because there were no means of attracting good men by providing them with comfortable quarters, &c. Since the building of the temporary barracks at the Rawalpindi workshops site, the Management are a little better off in this respect; and it is gratifying to state that the majority of the indifferent hands taken on during the pressure of traffic have been got rid of, and that the bulk of the drivers now on the line are a fairly steady and efficient lot of men.

Carriage and Wagon stock.—On the 1st April 1880 the following was the carriage and wagon stock on the main and Salt Branch lines :—

5′ 6″ gauge line—Coaching vehicles	87
Goods ,, ...	479
	566
Salt Branch line—Coaching vehicles	14
Goods ,, ...	142
	156

By the 31st March 1881 the stock on the main and Salt Branch lines had increased as follows by the receipt of new and transferred vehicles during the year :—

5′ 6″ gauge line—Coaching vehicles	124
Goods ,, ...	1,293
	1,417
Salt Branch line—Coaching vehicles	33
Goods ,, ...	223
	256

giving a total of 1,673 vehicles on the line and belonging to it on the last day of the financial year. Of this number, 10 brake-vans borrowed from the Madras Railway Company are not included. These vehicles were on this line at the close of the year.

During the year the stock has been maintained in good condition.

The commencement of the building of the Rawalpindi workshops could also be noted as a matter of interest; but as at the close of the year 1880-81 much progress had not been made with the work, mention of it may be deferred.

PUNJAB NORTHERN RAILWAY.

NORTHERN SECTION.

Financial Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	.....	—40,000	—39,646	10	—39,656	3,39,942	3,00,286	2,39,740
Land	.....	35,000	32,920	.....	32,920	46,263	79,183	
Construction of line	.....	28,71,000	30,85,457	142	30,85,315	6,63,164	37,48,479	
Ballast and Permanent-way ...	.....	24,70,000	46,96,146	.....	46,96,146	70,531	47,66,677	
Stations and Buildings	.....	9,41,000	10,71,657	2,098	10,69,559	66,794	11,36,353	
Total Construction Accounts ...	.....	62,77,000	88,46,534	2,250	88,44,284	11,86,694	1,00,30,978	2,39,740
Plant	.....	3,81,500	5,52,466	18	5,52,448	1,75,103	7,29,551	
Steam Ferries	.....	.....	.....	.....	.....	.....	.....	
Rolling Stock	.....	10,21,500	50,817	.....	50,817	.....	50,817	
Establishment	.....	4,53,689	4,36,217	483	4,35,734	1,51,497	5,87,231	
Total Expenditure on Final Heads...	.....	81,33,689	98,86,034	2,751	98,83,283	15,13,294	1,13,96,577	2,39,740
Suspense Accounts	.....	26,19,026	3,31,791	.....	3,31,791	15,67,421	18,99,212	
Grand Total Expenditure ...	79,64,000	1,07,52,715	1,02,17,825	2,751	1,02,15,074	30,80,715	1,32,95,789	

Distribution of outlay by funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Incorporated Local Funds.	Foreign Funds.	Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	.....	.....	86,76,118	.....	.....	.....	86,76,118
To close of the year	43,806	.....	1,11,47,127	.....	.....	.....	1,11,90,933

LAHORE TO JHELUM SECTION.

Financial Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	.....	.....	.....	.....	.....	4,89,450	4,89,450	4,89,450
Land	1,000	.....	.....	.....	.....	2,45,740	2,45,740	2,45,740
Construction of line	35,500	40,000	36,915	.....	36,915	1,15,80,030	1,16,16,945	1,16,80,001
Ballast and Permanent-way ...	48,630	11,900	9,651	.....	9,651	52,41,580	52,51,231	54,18,736
Stations and Buildings	1,00,144	1,55,000	1,52,805	.....	1,52,805	10,44,099	11,96,904	12,62,918
Total Construction Accounts ...	1,92,274	2,06,900	1,99,371	.....	1,99,371	1,86,00,899	1,88,00,270	1,90,86,845
Plant	1,018	—1,150	—563	.....	—563	11,21,760	11,21,197	11,22,190
Steam Ferries	.....	.....	.....	.....	.....	.....	.....	
Rolling Stock	.....	—11,000	—10,935	.....	—10,935	23,67,735	23,56,800	23,67,735
Establishment	4,708	250	206	.....	206	37,80,336	37,80,542	37,80,336
Total Expenditure on Final Heads...	2,00,000	1,95,000	1,88,079	.....	1,88,079	2,58,70,730	2,60,58,809	*2,63,57,106
Suspense Accounts	.....	3,000	—20,634	.....	20,634	83,196	62,562	.....
Grand Total Expenditure ...	2,00,000	1,98,000	1,67,445	.....	1,67,445	2,59,53,926	2,61,21,371	.....

* Outlay to 31st March 1880, plus the amount of sanctioned estimates from 1st April to 31st March 1881.

LAHORE TO JHELUM SECTION—*contd.*

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Incorporated Local Funds.	Foreign Funds.	Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	1,67,445	.....	.....	.....	.....	.....	1,67,445
To close of the year	1,95,15,655	.....	.....	.....	.....	.....	1,95,15,655

SALT BRANCH.

Financial Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	958	21,200	20,464	16	20,448	2,058	22,506	37,170
Land	116	15,000	14,712	.....	14,712	4,011	18,723	20,755
Construction of line	33,616	66,730	60,932	.....	60,932	1,60,934	2,21,866	2,31,544
Ballast and Permanent-way ...	42,800	1,64,448	1,60,860	.....	1,60,860	8,40,801	10,01,661	11,04,431
Stations and Buildings	78,200	60,791	56,361	255	56,106	74,786	1,30,892	1,47,748
Total Construction Accounts ...	1,55,690	3,28,169	3,13,329	271	3,13,058	10,82,590	13,95,648	15,41,648
Plant	2,216	3,543	3,488	.....	3,488	13,573	17,061	15,000
Steam Ferries	.....	.....	.....	.....	.....	.....	.....	.....
Rolling Stock	.....	1,34,681	1,47,520	.....	1,47,520	2,93,578	4,41,098	4,72,247
Establishment	18,642	18,500	18,888	.....	18,888	70,118	89,006	80,459
Total Expenditure on Final Heads...	1,76,548	4,84,893	4,83,225	271	4,82,954	14,59,859	19,42,813	21,09,354
Suspense Accounts	—200	1,607	4,347	.....	4,347	2,392	6,739	.....
Grand Total Expenditure ...	1,76,348	4,86,500	4,87,572	271	4,87,301	14,62,251	19,49,552	21,09,354

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Incorporated Local Funds.	Foreign Funds.	Grand
	Imperial.	Provincial.	Imperial.	Provincial.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	.....	.....	4,87,301	.....	.....	.....	4,87,301
To close of the year	.....	.....	19,49,552	.....	.....	.....	19,49,552

JHELUM-RAWALPINDI SECTION.

Financial Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	.....	.....	.....	.....	.....	3,59,571	3,59,571	3,60,000
Land	5,000	58,000	57,227	.....	57,227	1,82,310	2,39,537	2,59,940
Construction of line	7,91,750	25,52,255	24,91,169	.....	24,91,169	46,89,728	71,80,897	49,78,660
Ballast and Permanent-way ...	8,73,000	13,74,000	10,75,256	1,270	10,73,986	20,05,763	30,79,749	24,28,584
Stations and Buildings	1,74,720	4,45,280	4,51,466	1,802	4,49,664	2,70,246	7,19,910	5,53,506
Total Construction Accounts ...	18,44,470	44,29,535	40,75,118	3,072	40,72,046	75,07,618	1,15,79,664	85,80,690
Plant	83,000	1,33,000	5,423	1,250	4,173	6,48,154	6,52,327	3,21,513
Steam Ferries	.....	.....	.....	.....	.....	...	.....	.....
Rolling Stock	10,80,000	13,96,000	15,66,074	.....	15,66,074	1,858	15,67,932	10,86,656
Establishment	2,23,552	1,68,000	1,72,904	214	1,72,690	7,33,047	9,05,737	6,98,500
Total Expenditure on Final Heads...	32,31,022	61,26,535	58,19,519	4,536	58,14,983	88,90,677	1,47,05,660	1,06,87,359
Suspense Accounts	—6,89,163	—2,76,000	—2,91,465	.....		16,56,317	13,64,852	.....
Grand Total Expenditure ...	25,41,859	58,50,535	55,28,054	4,536	55,23,518	1,05,46,994	1,60,70,512	.....

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Incorporated Local Funds.	Foreign Funds.	Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	.....	.....	55,23,518	.....	.....	.....	55,23,518
To close of the year	66,14,518	.....	88,91,218	.....	.....	.....	1,55,05,736

Indus Valley Railway.

The leading events on the Indus Valley and Kandahar Railways have been summarised in Chapter I; and in Chapter II the construction works on the Upper and Lower Sections of the Kandahar Railway have been described in some detail, and information has been given regarding the bridge over the river Indus at Sukkur.

Extensions opened.

The following extracts from the Administration Report of the Indus Valley and Kandahar Railways supply facts regarding the working of those lines during the year. It will be seen that the following extensions were opened :—

	Miles.	Date of opening.
Ruk to Sibi ...	133	2nd May 1880 (for coaching traffic). 1st July 1880 (for coaching and goods).
Sibi to Pir Chauki ...	18½	11th October 1880 (for troop traffic only).
Sibi to Nari Gorge ...	7¼	Ditto ditto.

The principal feature in the working of the line was the troop traffic to and from Southern Afghanistan. His Excellency the Marquis of Ripon paid a visit to this line in November 1880.

War traffic.

As regards the troop traffic the annexed table shows the number of troops of all arms, followers, baggage and transport animals that were conveyed by the Railway during the time following the reverse that occurred to our forces at Maiwand :—

Month.	Special trains.	Troops and followers.	Horses, ponies, and mules.	Carts.	Camels and bullocks.	Heavy guns, stores, &c.	Baggage.
	No.	No.	No.	No.	No.	Mds.	Mds.
March	1	2,912	48	...	...	278	495
August	9	5,012	868	57	17	2,280	4,496
September	10	6,134	1,152	...	48	6,233	660
October	28	12,969	1,479	...	439	480	8,209
November	14	4,819	508	...	436	30	2,676
December	11	4,178	1,072	2	69	7	3,414
Total ...	73	36,024	5,127	59	1,009	9,308	19,950

The Railway invaluable as a means of transport.

But for the existence of the Railway, the whole of these troops would have been compelled to toil painfully over the burning sands of the barren and almost waterless desert, which stretches for over 70 miles between Jacobabad and Sibi, and which in the intense heat of August would have offered an almost impassable obstacle to the movement of a large force.

Extension of main line and branches.

In addition to the 501 miles of the Indus Valley Railway, and 7 miles of the Sind, Punjab and Delhi Railway between Mooltan and the junction at Muzaffarabad, worked by this State Railway, another length of 133 miles (between Ruk and Sibi) of the Kandahar Railway was added to the open mileage.

Under the orders of the Government of India, this section was handed over to the Manager on the 18th February 1880 for the carriage of troops and military and railway stores. But owing to want of accommodation, signals, &c., the line was not declared open for public traffic till some time afterwards.

The different stations were opened for public traffic on the following dates :—

On 2nd May 1880.—Shikarpur, Humaon, Jacobabad and Mittri (for coaching traffic only).

On 1st July 1880.—Shikarpur, Humaon, Jacobabad, and Mittri (for goods traffic).

On 1st July 1880.—Jutput, Lindsay, Templedera, Nuttall, and Bellput (for both coaching and goods traffic).

These were most unfortunate dates for the opening of the Kandahar branch line for public traffic—at the very time when the heat was most severe and the country most exposed to floods from the spill from the river Indus. The result was that between 9th June and 22nd July 1880 the line was breached in various places, and the Railway had in consequence to pay heavy demurrage charges on foreign stock, which, owing to the breaks in the line, could not be returned in proper time. The worst flood occurred on the 27th June 1880 between Nuttall and Bellput, and it carried away so much of the road that through communication was not restored until the 22nd of July 1880. This break was the more unfortunate as it occurred at the time that the demands of the military authorities for carriage of troops, cattle, and stores were at a maximum.

Besides the above length, the following branches were opened for the transport of troops returning from Kandahar :—

Sibi to Pir Chauki	18½ miles.
Sibi to Nari Gorge	7¼ „

These branches have not yet been opened for public traffic.

The total length of line open for public traffic on the 31st March 1881 was 641, against a total of 508 miles on the 31st March 1880. The total "Expenditure on final heads" on the Indus Valley State Railway during the year 1880-81 was Rs. 26,05,801, and the net expenditure to the end of 1880-81 has been Rs. 6,40,86,089; but the assumed capital on which the interest has been calculated has been taken at Rs. 6,26,84,638, being the net expenditure to the end of previous year, plus half the net expenditure during the year 1880-81. During the year 1880 there were on an average 575 miles of line open and under working; 1,722,368 train miles were run, earning Rs. 66,62,383 and costing Rs. 47,39,983, or 71 per cent., leaving 29 per cent. of the earnings as net profits. The earnings and expenses per train mile have been Rs. 3·87 and Rs. 2·75 respectively. The return on the capital expended was 3·09 per cent. per annum. Of the total earnings, coaching traffic contributed in round numbers 25 per cent., goods traffic 61 per cent., and sundries (including steam boat and electric telegraph) 14 per cent. In the same round figures, the maintenance of the line cost 11·3 per cent. of the gross earnings, the locomotive and carriage and wagon expenses 30·3 per cent., the traffic expenses 9·4 per cent., while general administration and sundry expenses cost 19·9 per cent. The earnings and expenses for the past two years are shown in the following table:—

Year.	Average miles open for traffic.	Earnings.			Expenses.		
		Gross.	Per mile per annum.	Per mile per week.	Gross.	Per mile per annum	Per mile per week.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1879 ...	508	32,77,540	6,452	124	26,60,079	5,237	101
1880 ...	575	66,62,383	11,586	223	47,39,983	8,244	157

Details of working.

Below are attached extracts from the reports of the working of the several departments for the year 1880-81; but before entering upon details, it is desirable to record a few brief remarks as to the general condition of the Indus Valley and Kandahar Railways.

In general, it may be said that the causes still actively at work in obstructing the business and in running up the expenditure on the line had their full effect on the working during the year 1880. Owing to the insalubrity of the climate, to the paucity of labor, to the scarcity of traffic, and to the liability of the country to serious inundations throughout the districts traversed by this Railway, the line will always, under the most favorable circumstances, from natural causes alone, be an expensive line to work.

Engineering Department.

During the year under review two executive divisions were abolished, and the line was formed in the following three divisions:—

First division	from	0	to	202	mile	
Second	„	„	202	„	304	„
Third	„	„	304	„	501	„

Maintenance of line.—During the first half of 1880 the Kandahar branch line was not maintained by Revenue; but in the second half of 1880 the maintenance of this section also formed a charge against Revenue, so that the mean mileage open throughout the year was 567·9 against 501·2

The total expenditure during the year amounted to Rs. 7,57,171 against Rs. 4,95,305 in 1879. The heavy expenditure is due to the very large staff which had to be maintained, owing to the unfinished state of the line when opened to public traffic, and also to the damage done to the way and works by floods.

The total cost of maintenance has been—

Labor.—Rs. 3,25,135, or about Rs. 42 per mile per month.

Materials: Rails.—The number of rails of all kinds renewed on the Indus Valley Railway during this year has been 157. 1,565 sleepers were renewed during the year. The total cost of materials per mile per month has been nearly Rs. 7.

Under the remaining heads of Abstract A (excluding General Superintendence) an expenditure of Rs. 13 per mile per month has been incurred. The heaviest item of this—Rs. 7—is chargeable to repairs of bridges, &c.

It is anticipated that before the close of the current year a considerable saving will have been effected of expenses in the Engineering Department.

The road has been kept in good order throughout the year.

Construction works.—The progress of the works constructed on account of Capital was as follows :—

Earthwork—First Division.—The raising of the banks from 150 to 162 miles has been finished, including the Kotsamaba station.

Third Division.—The drainage of the rock cuttings in the Laki pass was also finished, as well as the flattening of some of the slopes of the cuttings.

Bridgework: Major bridges—First Division.—The following bridges were constructed on the First Division—

1	span	of 60	feet,	Warren	girders, at mile	155.
3	spans	of 60	„	plate	„ „	156.
3	„	40	„	„	„ „	158.
61	„	40	„	„	„ „	159.

and a considerable proportion of the materials required for the construction of the three following bridges was manufactured :—

4	spans	of 60	feet,	plate	girders, at mile	161.
5	„	60	„	Warren	„ „	162.
16	„	40	„	plate	„ „	163.

The girders for all three bridges are on the ground.

Second Division.—A bridge of 10 arches of 10 feet span in the 262nd mile, which failed during the floods of 1879, was replaced by 10 spans of 40 feet plate girders, the waterway formerly provided at this place having proved totally insufficient.

Minor bridges—First Division.—All the minor bridges between miles 150 and 162 were raised to suit the altered formation level, and some of the open culverts were turned into arches.

Level-crossings—Third Division.—A number of gate lodges were built; but it is not intended to build any more for the present on the Railway, as they are not of much use until the line is fenced.

Fencing.—Very little fencing has been done, with the exception of a little palisadé fencing round the station platforms.

Tree-planting.—A few trees were planted at various stations ; but it can hardly be said that this important subject of the planting of stations was carried out in thes ystematic manner it should have been.

Ballasting—First Division.—The manufacture of brick ballast was continued from 0 to 55 miles, and the full quantity, 12 cubic feet to the foot run, has been put into the road from mile 113 to mile 160, with the exception of those miles where the bank is so new that it would have been wasted.

Second Division.—Some 40 miles have yet to be ballasted.

Third Division.—The line from mile 390 to Kotri is full ballasted, and on the other miles ballast is being manufactured as money is provided.

Stations and Offices.—Very little has had to be done to these beyond petty repairs. They are all in fair order. New stations were built at Sangi and Mahesar, and some of the station platforms were metalled during the year.

A goods-shed of metre gauge rails and corrugated iron was commenced at Larkhana, and the materials for passenger waiting-sheds at Bahawalpur, Khanpur, and Larkhana were collected in anticipation of sanction to the estimate.

Workshops.—The locomotive shops at Sukkur have made fair progress. The temporary building known as the temporary shops was nearly completed, as well as the roofing on the building originally intended for stores. The foundations of the smithy were laid. The iron roofing from the Bombay, Baroda and Central India Railway gave a good deal of trouble in erection, which to some extent delayed the completion of the stores building.

The sinking of the well for supplying water to these shops was begun at the river side to supply a tank to be excavated on the top of the rock near the workshops, called Adamsha-ka-Tikri.

Staff quarters.—The following is the list of staff quarters which have been built during the year :—

Shujabad	...	4 units of 4th class quarters.
Samasata	...	Double 3-unit latrine for Europeans.
		Single unit „ „
		Double „ „ Natives.

Firoza	...	Quarters for sub-inspector of maintenance.
Khanpur	...	The military rest-houses were completed to the military design and afterwards altered to fit them for the use of the Railway employés, in accordance with orders from the Government of India.
		10 units of 4th class quarters for Traffic menials.
		4 „ 3rd „ „ Locomotive Department.
		4 „ 3rd „ „ Traffic „
		4 „ of European latrine for Locomotive and Traffic Departments.
		1 unit „ quarters for „ Department.
Kotsamaba	...	Quarters for sub-inspector of maintenance.
Sadikabad	...	„ „ „
Reti	...	1 unit of 3rd class quarters for carriage examiner.
		Native doctor's „
		Mortuary.
		1 unit of European latrine.
		4 units of Native latrines.
Khairpur	...	1 unit of 3rd class quarters for Traffic Department.
Sarhad	...	Quarters for station staff.
Sangi	...	Native stationmaster's quarters.
Rohri	...	Military rest-houses were commenced here, but only one building is roofed ; it is not at present occupied.
		Carriage examiner's quarters.
Rohri Bunder	...	3 double 1st class units.
		5 „ 3rd „ „
Sukkur	...	6 1st class units.
Ruk	...	Quarters for sub-inspector of maintenance.
Naundero		„ „ „
Larkhana	...	Executive engineer's office.
Radhan	...	12 menial quarters.
		European latrines.
		Mortuary.
		6 units of guards and drivers' quarters.
		3 „ 3rd class quarters.
		Native doctor's quarters.
		1 unit of latrine for Natives at engine depôt.
Bugatora	...	Quarters for inspector of maintenance.
Laki	...	European latrines.
		Carriage examiner's quarters.
Amri	...	Quarters for sub-inspector of maintenance.
Manjhand	...	„ „ „
Budapur	...	Quarters for inspector of maintenance.
Petaro	...	„ sub-inspector of maintenance.
Kotri	...	European latrines.
		12 units of guards and drivers' quarters.
		12 „ temporary quarters for Locomotive Department.
		1 unit of latrine for Natives at engine depôt.

And besides these, 24 huts for maintenance gangs where they were most required.

Station machinery.—The station machinery at Kotsamaba was raised to suit the altered levels.

A new well was built at Rohri in the bed of the river for supplying water to Rohri main engine-shed, and another was built at Radhan; but the fittings have not been completed, owing to delays in their supply.

Sukkur-Rohri Ferry.—The ferry has on the whole worked successfully, considering the makeshift character of the machinery on it.

To facilitate the loading and unloading of the barges, five steam winches have been ordered from England, which it is hoped will make the work easier than it is at present.

On the Rohri side the sandbanks have always proved troublesome and dangerous, and to obviate this a breakwater of stone is being built from Satian along the edge of the cold weather bank of the river to opposite the Rohri Bunder station, which, when completed, will reclaim a very large area of sandbank.

It is hoped by means of this that a fixed point will be secured at which the pontoons can be established and the ferry worked over them for some eight months a year. Possibly it may be found afterwards that the ferry traffic could be worked during the floods very near the same place, and the present flood season slips, which are nearly a mile down the river, may be abandoned. If this could be done, a very great saving will be effected in the cost of working the ferry. Should the bund be successful in reclaiming the ground as intended, it will greatly improve the working at the Rohri Bunder station, the reclaimed land being utilised for additional sidings, &c.

Locomotive and Carriage and Wagon Departments.

Rolling stock.—The rolling stock in hand on the 31st March 1881 was as follows:—

97 locomotives.

299 coaching vehicles.

2,068 goods ,,

The average number of engines taken out of running for repairs during the year 1880 was 10, which is equivalent to 10·30 per cent. of the total locomotive stock on the line on the 31st March 1881. The cause of these heavy engine repairs is chiefly due to—

(1) the bad water along the line;

(2) second-hand engines sent to this Railway.

Bad water.—Endeavours are being made to improve the water-supply; and the Locomotive Superintendent has received detailed instructions to thoroughly analyse the water obtained from different sources along the line, and to submit a report immediately after the rainy season, as the present time is not favorable for such a test.

Second-hand engines.—Owing to the number of engines sanctioned for this line not having been supplied, and to the fact that out of the H class stock 12 engines were lent to the Punjab Northern Railway, which have not yet been returned, the following locomotives were obtained from different Railways:—

11 engines in 1879 were borrowed from the East Indian Railway, and 5 worked on the line up to June and 6 up to September and October 1880.

5 engines from the Sind, Punjab and Delhi Railway, and worked up to February and March 1881.

12 engines from the Punjab Northern Railway, of which 10 were Madras Railway engines and 2 H class. Five of the Madras Railway engines were received in November 1879 and 5 in January and February 1880. Two of these, however, could not be put to work in consequence of defects; 3 were returned in April, 2 in June, and 5 in October 1880. The 2 H class engines only worked for a few weeks.

The following tables show the comparison of expenses in the Locomotive and Carriage and Wagon Departments during 1879 and 1880:—

Locomotive Expenses.

	1879.	1880.
	Rs.	Rs.
General superintendence	75,503	1,09,478
Running expenses	1,96,525	3,40,495
Fuel	3,45,178	8,93,439
Water	35,682	34,876
Oil, tallow, and other stores	51,331	80,671
Maintenance and renewal of locomotive engines and machinery	1,80,184	3,15,656
New minor works	3,669	5,782
Unclassified expenditure	...	234
Total ...	8,88,072	17,80,631

Carriage and Wagon Expenses.

	1879.	1880.
	Rs.	Rs.
General superintendence	10,798	19,850
Repairs and renewals of vehicles and machinery ...	94,356	1,47,764
Cleaning carriages and wagons, and oiling ...	34,362	58,587
New minor works	14,211	16,814
Unclassified expenditure	43	9
Total ...	1,53,770	2,43,024

TRAFFIC DEPARTMENT.

With a view to facilitate the work, the line was divided into the following sections, each in charge of a District Traffic Manager :—

Northern Section from Mooltan to Rohri	...	281 miles.		
Southern	,,	,,	Sukkur ,, Kotri	... 227 ,,
Lower	,,	,,	Ruk ,, Sibi	... 133 ,,

The traffic of the line, mostly owing to transactions in connection with the Afghan war, was nearly double what it was in the previous year. The following table will show the receipts of the year as compared with that of 1879 :—

Items of receipts.	1879.	1880.	Increase in 1880.
	Rs.	Rs.	Rs.
Coaching	7,93,996	18,03,907	10,09,911
Goods	22,01,808	40,08,327	18,06,519
Sundries	2,81,732	8,50,149	5,68,417
Total ...	32,77,536	66,62,383	33,84,847

Passenger traffic.—1,364,425 passengers were booked and carried for an average distance of 71 miles against 831,883 in 1879 carried for an average distance of 60 miles, showing an increase of 532,542 passengers. The passenger mileage or number of passengers carried over one mile in 1880 was 98,889,867, or about 446 passengers per mile open per day. The average contents in 3rd class vehicles were 38·52 persons against 36·07 in the previous year.

The earnings from passengers were Rs. 18,03,907 in 1880 against Rs. 7,93,997 in 1879. The following table shows the number of passengers booked at the principal stations on the line during 1880 :—

Mooltan	...	88,536	Ruk	...	142,892
Shujabad	...	35,662	Larkhana	...	53,631
Bahawalpur	...	69,964	Sehwan	...	38,990
Ahmadpur	...	44,246	Kotri	...	52,242
Khanpur	...	30,192	Shikarpur	...	58,313
Rohri	...	46,501	Jacobabad	...	54,849
Sukkur main	...	85,152	Sibi	...	72,083

Goods traffic.—The weight of goods carried in 1880 was 505,919 tons against 235,836 ons in 1879, showing an increase of 270,083 tons.

The earnings from goods traffic were Rs. 40,08,327 against Rs. 22,01,809 in 1879, showing an increase of Rs.18,06,518.

The average distance over which consignments of goods were carried was 203 miles in 1880, against 175 miles in 1879.

The total traffic train mileage was 1,721,719 against 909,727 miles in 1879.

The average number of vehicles per train was 24·98 in 1880 against 19·67 in 1879.

The average receipts per train mile were Rs. 3·70 in 1880 against Rs. 3·99 in 1879.

The number of loaded goods vehicles run in 1880 was 17,774,044, and the number of empties 9,773,980, or, in other words, the number of empties run was 55 per cent. of the whole.

The following table shows the weights of the principal goods booked in 1879 and 1880 :—

Description.	1879.	1880.	Difference.	
			Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
II.—Cotton	7,245	9,167	1,922	...
VI.—Fruits and Nuts	3,778	5,685	1,907	...
VII.—Grains and Pulses	28,053	56,558	28,505	...
XVIII.—Sugar	7,660	15,105	7,445	...
XX.—Wood (Timber)	1,909	29,418	27,509	...
XXI.—Wool	3,612	6,300	2,688	...
XXII.—All Other Merchandise—				
Building materials	1,705	12,307	10,603	...
Miscellaneous	9,369	22,251	12,882	...
XXIII.—Military Stores	10,946	39,562	28,616	...
XXIV.—Railway material for Foreign lines ...	134,744	277,849	143,105	...
XXV.— Ditto Construction ...				
XXVI.—Coal	792	5,060	4,268	...

There has been no important alteration in the goods rates during the year.

The increases in the receipts of principal commodities appear to be due to the following causes. Increase in cotton, fruits and nuts, grains and pulses, sugar, and timber is partly due to reduced rates charged for carriage over Indus Valley Railway, but principally to development of traffic occasioned by special demands of the Commissariat Department, and of the Kandahar and Punjab Northern Railways for troops and construction of rolling stock and railway work respectively.

Increase in military stores and miscellaneous is due to heavy demands of the Commissariat Department.

Increase in coal is owing to coal being used more extensively in 1880 than in 1879, and also on account of opening of Kandahar Railway.

Compensation claims.—An amount of Rs. 32,843 against Rs. 38,197 in 1879 was paid on account of compensation for claims during 1880. Though this state of affairs is far from satisfactory, it must be borne in mind that the greater portion of this was paid on account of compensation for goods lost or damaged in the very early days of the Indus Valley Railway, when the line was opened for public traffic, on the commencement of the first Afghan war in 1878. The whole length of the line (501 miles) had to be thrown open for the use of the public within a short period of three months, July to October. This caused great difficulties in the collection and organisation of the traffic staff, recruited necessarily from any men that could be induced to join. In addition to this, the demand for labor and the heavy State expenditure on account of Kabul campaigns attracted bad characters to the vicinity of the line from every part of India. The pressure of the Commissariat work and of the military requirements, coupled with the inexperience of the station staff and want of proper watch and ward, gave opportunities for theft and pilfering, which were unfortunately availed of to a large extent.

The traffic expenses during 1880 compare as follows with those of 1879 :—

	1879.	1880.
	Rs.	Rs.
Salaries, wages, &c.	54,252	72,268
Station staff	1,32,913	2,39,805
Train staff	46,845	97,419
Fuel, &c.	52,092	1,29,525
Clothing	548	7,900
Printing and stationery	1,11,133	42,818
Miscellaneous expenses	13,384	7,784
Payments to other lines	28,441	31,487
Unclassified expenditure	1,600	255
Total ...	4,41,208	6,29,261

The traffic of the year 1880 was so much greater than that of 1879, that it is impossible to briefly explain the causes of these great differences in the expenditure under the various heads.

The very large number of cattle accidents on this line is entirely due to the total absence of fencing of any kind. During the inundation season, when the surrounding country is full of water, the cattle naturally prefer to resort to the high and dry embankments of the Railway, and numbers are consequently killed.

Accidents of failure of machinery also deserve some mention. The principal cause of failure of the engines is bad water on the main line and scanty watering arrangements on the branch line.

Punctuality.—On the main line the mail service ran fairly to time; but on the Kandahar branch line, owing to want of good watering arrangements and the failure of the engines, the working was most unsatisfactory. Every effort is now being made to secure greater punctuality.

Train service.—The train service during the whole year consisted of two passenger trains, one mail and one mixed, both ways, with regular and extra goods and special troop trains as required. In the latter part of the year local services were introduced. The Traffic Superintendent writes: "Unfortunately we were unable to prepare (owing to the very short notice) special time-tables for this service, and in consequence had to utilise time-tables already in use for goods and troop traffic, so that on almost every occasion that we ran a troop-train, it became necessary to cancel the running of the local train of that date. Owing to this arrangement, the local services have not hitherto had a fair trial." And therefore no opinion relative to financial success of these services can at present be pronounced.

New stations.—Prior to January 1881 the Rohri main station was simply a "line clear station." It was opened in January 1881 for 3rd class passenger traffic, being within easy distance of the native town of Rohri. The earnings are reported to be satisfactory.

Indus ferry.—Though the arrangements for crossing the goods over the river Indus have very much improved during the year, it is still sometimes a source of anxiety, and the want of a permanent bridge is very much felt. It will be perhaps impossible to derive full benefit from the Railway till a permanent bridge has been constructed over the river Indus.

During the year ending 31st March 1881, 23,052 vehicles and 102 engines were crossed without breaking bulk. This large number was crossed without a single accident of a serious nature.

Provident Institution.—This institution was commenced in March 1880, under the orders contained in Government of India Resolution, Department of Finance and Commerce, No. 128, dated the 10th January 1880.

The following shows the number of compulsory and voluntary depositors, and the amount of their deposits on the 30th September 1880 and 31st March 1881 :—

State Railway Provident Institution.	Depositors.			
	Compulsory.		Voluntary.	
	No.	Amount.	No.	Amount.
		Rs. A. P.		Rs. A. P.
Number of depositors on 30th September 1880	668	5,690 12 1	24	7,308 0 1
„ „ 31st March 1881 ...	887	22,628 4 8	225	48,977 13 3
Bonus of half-year ending 30th June 1880 ...	...	1,937 7 0	...	... ...
„ „ 31st December 1880	...	3,775 13 3	...	... ...

The bonus declared for the first half of 1880 was equal to 100 per cent. on the compulsory contribution ; but for the second half of the year, owing to the larger number of contributors and the smaller net revenue, the bonus was equivalent only to 35½ per cent.

Store Department.

Clear and detailed instructions have been issued in order to place the working of the Store Department on a better footing; but in the absence of proper accommodation for the custody of stores, there is no hope of effecting a complete control.

Capital Finance Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81.					Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital outlay.	Net expenditure.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses	...	...	4,529	...	4,529	10,80,406	10,75,877	10,80,406
Land	15,460	5,410	46,046	20	46,026	2,56,680	3,02,706	2,62,090
Construction of line	5,56,565	5,05,784	4,51,272	206	4,51,066	2,13,96,364	2,18,47,430	2,19,02,148
Ballast and Permanent-way	5,07,381	7,71,765	7,01,981	320	7,01,661	1,72,02,410	1,79,04,071	1,79,74,175
Stations and Buildings	7,69,871	5,36,046	4,59,279	222	4,59,057	39,93,195	44,52,252	45,29,241
Total Construction Accounts ...	18,49,277	18,19,005	16,54,049	768	16,53,281	4,39,29,055	4,55,82,336	4,57,48,060
Plant	52,972	41,255	14,473	...	14,473	15,92,489	15,78,016	16,33,744
Steam Ferries	...	43,000	30,953	...	30,953	3,349	34,302	46,349
Rolling Stock	...	7,24,786	8,97,287	406	8,96,881	64,79,224	73,76,105	72,04,010
Establishment	1,50,476	20,000	37,985	16	37,969	68,11,330	68,49,299	68,31,330
Total Expenditure on Final Heads ...	20,52,725	26,48,046	26,05,801	1,190	26,04,611	5,88,15,447	6,14,20,058	6,14,63,493
Suspense Accounts	46,725	1,05,000	1,98,291	...	1,98,291	24,67,740	26,66,031	25,72,740
Grand Total Expenditure ...	20,06,000	27,53,046	28,04,092	1,190	28,02,902	6,12,83,187	6,40,86,089	6,40,36,233

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.	
	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	22,78,550	...	...	...	22,78,550
To close of the year	4,97,59,518	...	...	...	4,97,59,518

Appropriation and Outlay Account of Revenue and Expenditure, 1880-81.

Particulars.	Original Budget Estimate.	Regular Budget Estimate.	Actuals.	Remarks.
	Rs.	Rs.	Rs.	
Receipts.				
Earnings of the Line.				
Coaching traffic	10,00,000	16,99,000	90,20,439	
Goods traffic	32,00,000	45,29,000	43,62,690	
Electric Telegraph earnings	10,000	10,000	14,138	
Steam Boat earnings	1,05,000	1,87,000	2,23,251	
Sundries	2,15,000	4,00,000	4,23,561	
Total Earnings of the Line (1) ...	45,30,000	68,25,000	69,44,079	
Deduct *increase* in balance of outstanding earnings	30,000	1,25,000	1,23,814	
Total Receipts (2) ...	45,00,000	67,00,000	68,20,265	
Expenditure.				
Working Expenses.				
Maintenance of Way, Works, and Stations ...	7,00,000	7,00,000	8,30,472	
Locomotive Expenses	13,40,000	18,00,000	18,88,799	
Carriage and Wagon Expenses	2,10,000	2,00,000	2,57,190	
Traffic Expenses	6,50,000	6,75,000	6,38,358	
General Charges	3,00,000	3,75,000	3,66,992	
Steam Boat Service	1,05,000	1,80,000	1,85,309	
Special and Miscellaneous Expenditure ...	1,95,000	7,50,000	7,90,803	
Total Working Expenses (3) ...	35,00,000	46,80,000	49,57,923	
Add increase of or deduct decrease to Grant	...	...	...	
„ „ „ to net debit	...	...	...	
Balance of Suspense Account	...	35,000	5,518	
Deduct increase to Credit Balance of Demands Payable	...	65,000	1,53,886	
Net Expenditure against Grant (4) ...	35,00,000	46,50,000	48,09,555	
Net Earnings (1)—(3) ...	10,30,000	21,75,000	21,34,524	
„ Receipts (2)—(4) ...	10,00,000	20,50,000	20,10,710	

NORTH-WESTERN PROVINCES AND OUDH.

The Administration Report of the above Government gives the following information regarding the working of Railways in those Provinces up to the 31st March 1881:—

PROVINCIAL LINES.

PRODUCTIVE PUBLIC WORKS.

Muttra-Hathras Railway.

At the end of the financial year 1880-81 this line, constructed on the metre gauge of 3′ 3⅜″, had been working 5½ years, having been opened for traffic on the 19th October 1875.

The capital expenditure to 31st March 1881 amounted to Rs. 10,86,470, giving, for a length of line of 29 miles, a cost of Rs. 37,465 per mile. Only one charge for capital construction was incurred during the year, on account of a new goods-shed at Hathras city, to provide shelter for goods awaiting despatch, costing Rs. 2,907.

The line continues to show increased prosperity and to earn a fair return on the capital expended; but as the working expenses have increased as well as the traffic earnings, the net earnings for the year are only Rs. 4,494 more than in the previous year. The following table shows the earnings and expenses of 1880-81 as compared with those of 1879-80:—

	1879-80.	1880-81.	Increase in 1880-81.
Traffic Earnings—	Rs.	Rs.	Rs.
Coaching	84,908	90,724	5,816
Goods	33,352	47,452	14,100
Telegraph	...	1,175	1,175
Sundries	1,130	2,143	1,013
Total ...	1,19,390	1,41,494	22,104
Working Expenses	65,813	83,423	17,610
Net Earnings ...	53,577	58,071	4,494

The proportion of working expenses to earnings in these years was respectively 55·12 and 58·95 per cent., being an increase in 1880-81 of 3·83 per cent., mainly due to increase in traffic and consequent wear and tear. The increase in working expenses, aggregating Rs. 17,610, is made up as follows:—

	More.	Less.
	Rs.	Rs.
Maintenance of Way and Works	5,944	...
Locomotive Expenses	7,710	...
Traffic Expenses	2,342	...
General Charges	2,146	...
Carriage and Wagon Expenses	...	249
Miscellaneous ...	...	283
Total ...	18,142	532
Net Excess	17,610	

The number of passengers and quantity of goods carried as compared with previous years are—

		1878-79.	1879-80.	1880-81.
Passengers	Nos.	255,701	314,762	336,286
Goods	Tons	22,274	30,678	33,092

showing an increase of passengers 22,524 and goods 2,414 tons over 1879-80. This is not so marked an increase as was exhibited in the previous year; but the earnings on goods have been very much greater, as a far larger proportion was carried over the whole length of the line to Muttra for transport to Bhurtpur territory, the ton mileage being materially increased. The experience of 1880-81 leads to the conviction that, with the opening of the Muttra and Achneyra line and the construction of the bridge over the Jumna and Muttra, a considerable increase to traffic towards Rajputana by this route may be confidently anticipated.

There was no unusual inducement in the way of more than ordinarily important fairs to attract passenger traffic during the year as there was in 1879-80.

The financial condition of the undertaking at the close of 1880-81 is represented in the following table:—

Expenses.		Earnings.	
	Rs.		Rs.
Interest on Capital outlay and Working expenses to end of 1879-80.	4,58,146	Gross earnings to end of 1879-80 ...	4,48,398
Indent on Capital outlay and Working expenses to end of 1880-81.	1,27,065	„ „ 1880-81 ...	1,41,494
Total ...	5,85,211		
Surplus profit, 1880-81 ...	4,681		
Grand Total ...	5,89,892	Total ...	5,89,892

Hence in 1880-81 the earnings were more than the expenses by Rs. 14,429, which clears off the debt of Rs. 9,748 due to Government at the close of 1879-80 for unrealised interest, &c., Rs. 4,681, and leaves a divisible surplus of 0·43 per cent. on the capital for 1880-81. A larger surplus was anticipated, but the increase in working expenses has prevented its realisation.

The whole of the gross earnings, Rs. 5,89,892, will be received by Government, which *per contra* has to pay the following sums:—

	Rs.	Rs.
To subscribers for interest and share of surplus profit—		
To close of 1879-80, interest	74,787	
In 1880-81, interest	12,964	
„ share of surplus profits ...	1,396	
Total to shareholders ...		86,147
For working expenses ...		3,30,192
Grand Total ...		4,16,339

leaving a surplus to Provincial funds of Rs. 1,73,553.

The capital on 31st March 1881, Rs. 10,86,470, has been subscribed—

	Rs.
By shareholders	3,24,100
By Government	7,62,370
Total ...	10,86,470

Shareholders have to receive up to 31st March 1881 Rs. 86,147 on their capital of Rs. 3,24,100, or 26·58 per cent. Government on its share of Rs. 7,62,370 receives Rs. 1,73,553, or 22·76 per cent.

The less percentage received by Government is due to shareholders having received 4 per cent. interest on their capital from the date they subscribed it, while Government only realised from the date the Railway opened for traffic. The agreement with the shareholders is not exactly the same as for Guaranteed lines. It provides that when the accumulated interest and working expenses have all been realised, any surplus earnings there may be shall be divided rateably between the Government and shareholders in proportion to the capital held; any surplus received by the shareholders being in addition to the 4 per cent. interest on their subscribed capital.

The current year (1880-81) is the first year in which there has been any such surplus, though the net earnings have since 1877-78 always exceeded the 4 per cent. interest. Thus they were—

In 1877-78	4·11 per cent.
In 1878-79	4·41 „
In 1879-80	4·89 „

The cause of this apparent discrepancy is the agreement made by the Government of India with the shareholders of this line, that all the accumulated interest on capital outlay during construction must be a first charge against the revenue earned, and that surplus profits

would only accrue when all this interest and the working expenses had been entirely worked off. The following statement shows how this agreement has worked :—

Year.	Charges.			Earnings.	Balance.	
	4 per cent. interest on Capital outlay.	Working Expenses.	Total.		Less.	More.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1873-74	358	...	358	...	358	...
1874-75	11,064	...	11,604	...	11,604	...
1875-76	33,544	19,287	52,831	34,213	18,618	...
1876-77	38,875	49,190	88,065	91,335	...	3,270
1877-78	41,821	52,518	94,339	95,546	...	1,207
1878-79	42,107	59,961	1,02,068	1,07,914	...	15,846
1879-80	43,608	65,813	1,09,421	1,19,390	...	9,969
1880-81	43,642	83,423	1,27,065	1,41,494	...	4,429
Total ...	2,55,019	3,30,192	5,85,211	5,89,892	30,040	34,721

Net surplus at close of 1880-81—

		Rs.	
To shareholders' capital, Rs. 3,24,100	...	1,396	Rs. 4,681
To Government „ „ 7,62,370	...	3,285	

The working and general management of the line have been highly satisfactory, and there have been no serious accidents during the year. The only special occurrences worthy of notice were the opening of the line of telegraph from Muttra to Hathras Road, which came into working for the line in July 1880, the transfer of the offices of the line to Cawnpore in December 1880, and the concentration there of the provincial management, locomotive, traffic, and audit head-quarters. A Traffic Inspector has been kept at Muttra in immediate charge of the traffic working, and the arrangement has generally worked satisfactorily, though of course the distance of the line from its head-quarters is a disadvantage.

Cawnpore and Farukhabad Railway.

This line, also constructed on the metre gauge, was partially opened for traffic on the 15th December 1880, as far as Miran Serai, a length of nearly 49¼ miles. On the 1st February 1881, after the completion of the Kali Nadi diversion, the remaining section to Farukhabad was also opened, making a total length of line of 86 miles. It was thus worked for 48 days over 49 miles and for 59 days over the whole 86 miles.

The capital expenditure to 31st March 1881 amounted to Rs. 30,45,749, or for 86 miles a rate of Rs. 35,416 per mile to date; but there is still considerable further outlay to be incurred against capital on account of rolling stock, the Kali Nadi bridge, and other works in progress but not completed during 1880-81.

The total earnings of the line during 1880-81 were Rs. 49,467, and the working expenses Rs. 36,628, showing net earnings during the year, Rs. 12,829.

The number of passengers carried was 113,589, and the quantity of goods lifted 3,530 tons.

The gross earnings in 1880-81 represent 5·54 per cent., and the working expenses 4·10 per cent. per annum on the capital expended.

The line was opened late in the year at a dull season as regards trade and under considerable disadvantages as to working; and no practical results would be attained by elaborating the financial details for so short a period. Its prospects have, however, been steadily improving, and when the proposed extension *vid* Khasganj to Hathras Road is completed and through communication without break of gauge to Rajputana established *vid* Muttra and Achneyra, this Railway may be confidently expected to prove a financial success.

The old telegraph line to Fatehgarh was dismantled by the Telegraph Department during the year, and a new line put up along the Railway. Every station is in connection with it, and the Government office at Fatehgarh has been abolished and the business transferred to the Railway offices.

The head-quarters of the open line were located at Cawnpore and amalgamated with those of the Muttra-Hathras Railway, both lines being placed under one Engineer-in-Chief and Manager. No accidents occurred to life in 1880-81, and those that did occur at all were insignificant.

Ghazipur-Dildarnagar Railway.

This short branch line, 12 miles in length, connects the Ganges at Tari Ghat, opposite Ghazipur, with the East Indian Railway at Dildarnagar, and is constructed on the broad (5′ 6″) gauge. It was opened for traffic on the 5th October 1880, and has been worked by the East Indian Railway under an arrangement entered into between the Government and that Company.

The capital expended on this line up to 31st March 1881 is Rs. 5,93,539, which for 12 miles gives a cost of Rs. 49,462 per mile without rolling stock, which is found by the East Indian Railway. The details of the capital expenditure during the year and to date as compared with the sanctioned estimate have been given in the previous chapter.

The working expenses up to 31st March 1881 were Rs. 23,183, and the gross earnings Rs. 17,878, or a net loss of working of Rs. 5,305 during the year. Thus for 178 days the working expenses were Rs. 130·2 and the earnings Rs. 100·4 per diem, or for each mile open working expenses were Rs. 10·85 and earnings Rs. 8·36 per diem on the capital expended.

The working expenses are equal to Rs. 8·01 per cent., and the earnings 6·36 per cent. per annum. The agreement between Government and the East Indian Railway is that the East Indian Railway Company finds rolling stock and works and maintains the line, charging their own train mileage rates and taking two-fifths of the net receipts as their share of the profits.

The line has not been working sufficiently long to permit of certain conclusions being drawn from the financial results herein indicated; but it is evident that, as the East Indian Railway Company fixes the working expenses not from actuals but by the proportion the 12 miles of this line bear to the whole cost of length of its own open lines, the earnings must increase to a very great extent indeed to make this short branch a paying concern.

The number of trains originally run was reduced by two per diem as soon as it was found that the line was working at a loss, and further reduction is deprecated, as likely to cause a falling off in the traffic by driving it back to the road, owing to the very long intervals between the trains.

Muttra-Achneyra Railway.

This line is still under construction on the metre gauge, and is described in the chapter on Construction.

The following table shows the capital outlay during the year on Railways in these Provinces:—

Railways.	Amount.	Increase and decrease of suspense balance.	Total.
	Rs.	Rs.	Rs.
IMPERIAL.			
Productive Public Works.			
Muttra-Hathras	2,541	— 11,691	—9,150
Ghazipur-Dildarnagar	1,44,953	— 3,749	1,41,204
Cawnpore-Farukhabad	11,00,453	— 31,497	10,68,956
Muttra-Achneyra	1,99,310	†2,09,388	4,08,698
Total ...	14,47,257	†1,62,451	16,09,708
Surveys.			
Patna-Bahraich	1,018	†3,300	4,318
Total ...	1,018	†3,300	4,318
PROVINCIAL.			
Surveys.			
Bareilly-Pilibhit	10,676	† 956	11,632
Mau-Ranipur	— 1,461	...	— 1,461
Banda-Manikpur	— 1,596	...	— 1,596
Jaunpur	— 634	...	— 634
Gorakhpur	— 637	...	— 637
Gonda	— 531	...	— 531
Lucknow	— 846	...	— 846
Moradabad	530	...	530
Bhaupur-Kalpi	11,083	† 14	11,097
Cawnpore-Farukhabad Extension	5,200	† 49	5,249
Total ...	21,784	†1,019	22,803

GENERAL.

The following is the total capital expenditure during the year and to date on all State Railway projects in these Provinces:—

Projects.	Outlay.		
	To 31st March 1880.	During 1880-81.	Total on 31st March 1881.
	Rs.	Rs.	Rs.
Muttra-Hathras	10,95,620	—9,150	10,86,470
Ghazipur-Dildarnagar	4,52,335	1,41,204	5,93,539
Cawnpore-Farukhabad	19,76,793	10,68,956	30,45,749
Muttra-Achneyra	53,108	4,08,698	4,61,806
Imperial Surveys	...	4,318	4,318
Provincial Surveys	3,56,201	22,803	3,79,004
Total	39,34,057	16,36,829	55,70,886

The following is an abstract of the earnings and working expenses on open lines for 1880-81—

Railways.	Gross earnings.	Working expenses.	Earnings.	
			More.	Less.
	Rs.	Rs.	Rs.	Rs.
Muttra-Hathras	1,41,494	83,423	58,071	...
Ghazipur-Dildarnagar	17,878	23,183	...	5,305
Cawnpore-Farukhabad	49,467	36,638	12,829	...
Total ...	2,08,839	1,43,244	70,900	5,305
			65,596 net	

or for a capital of Rs. 47,25,758 expended on these lines—

Gross earnings	...	...	...	4·4 per cent.
Working expenses		...	...	3·0 „
Net earnings	...	...	...	1·4 „

BENGAL.

The following extracts from the Progress and Administration Report on State Railways within the Province of Bengal affords information concerning Railways under that Government during the year ending 31st March 1881:—

The following Railways and Tramways under the administration of Bengal are open for traffic:—

I.—The Northern Bengal Railway.
II.—The Tirhoot Railway.
III.—The Patna and Gya Railway.
IV.—The Calcutta and South-Eastern Railway.
V.—The Nalhati Railway.
VI.—The Darjeeling Steam Tramway (a portion open for traffic).

Northern Bengal Railway.

The length of line open for traffic was 243 miles, no additions thereto having been made during the year. The working of the Railway during the period under review may be taken as a starting-point on which to base deductions in future years.

In past years the statistical results arrived at have always been affected by abnormal causes, and they are therefore unreliable for purposes of comparison.

The total earnings during the year were Rs. 16,34,588; the expenditure Rs. 9,25,145, or 56·60 per cent. of the gross amount earned. This result, which, it is hoped, will be considered satisfactory, has been brought about by the exercise of a most rigid economy in all departments, the earnings having fallen considerably below expectations. The fluctuations in traffic are fully explained in connection with the working of the Traffic Department.

The management of the line in all departments has left nothing to be desired. It is satisfactory to note that the subordinate employés of the Railway are now being largely drawn from the districts through which the Railway passes, and with most advantageous and economical results.

Some further progress has been made in the construction of feeder roads, but a great deal still remains to be done. Good roads, open throughout the year from all the principal marts, would, it is believed, largely augment the traffic; and if an officer could be deputed to report on the roads existing and their condition at the end of the rains, a comprehensive scheme of operations for the ensuing working season could be prepared.

As anticipated in last year's report, a large reduction has been made in the expenditure on coal. The quality supplied was superior to that previously obtained, the price was less, and it was taken over by weight and not by measurement, by which means a guarantee was afforded that the quantity paid for was actually delivered.

The Darjeeling Tramway was opened to Sonada during the year, and through booking was introduced between the Eastern Bengal Railway, Northern Bengal Railway, and the Tramway. The latter is now opened to Darjeeling, and the result has been an increase to the passenger and goods traffic of this Railway; but the full benefit of the facilities thus afforded to traffic, in both passengers and goods, will not be obtained until the Tramway is fully equipped with rolling-stock.

The river Ganges silted up at old Damukdea, and it was deemed advisable to lay a fair-weather extension from the old station to a point opposite Saraghat, a distance of about 4 miles. A small saving was thus effected in the expenditure on the steam boat service, but the result of working the extension has not been altogether satisfactory financially, and it is not proposed to relay the line after the rains. In order, however, to maintain the present through timing of the mail service, an extension on the Sara side of the river for about 3 miles has been laid. It is expected that the expenditure involved in working this extra mileage will be met by a corresponding saving in the ferry department, owing to the shorter steamer run.

The line was not tried severely by floods during the year. The most remarkable occurrence was the derailment of a passenger train on the Rangpur Branch by a heavy gale of wind on the 4th March. Seven carriages, some of which contained passengers, were blown over; but fortunately no one was hurt.

The European and East Indian staff decreased from 94 to 79, the Native staff from 2,278 to 2,206, owing to reduction of establishments.

The capital expenditure during the current year will be trifling, and there will be, it is expected, large credits arising from the sale of surplus stores, broad gauge permanent-way materials, and steamers, &c.

The details of capital expenditure up to the 31st March 1881 under the various heads are given in the detailed narrative. The amount required to pay 4½ per cent. interest on this outlay for the year is Rs. 9,41,138, towards which the net earnings have contributed Rs. 7,09,443, leaving a deficit to be met from general revenues of only Rs. 2,31,695.

Dinagepore Branch and Extension to the Ganges.—It has been proposed to construct from Provincial funds a branch Railway from Parbatipur station on the Northern Bengal Railway to Dinagepore, a distance of 19 miles, at an estimated cost of Rs. 11,91,083. The general question of short branch railways as ordinary provincial public works having been referred by the Government of India to the Secretary of State, pending his reply, the work will be put in hand as a feeder road, to be completed hereafter as a railway should sanction be given; and a grant for this purpose of Rs. 4,50,000 has been set aside for the current year. In connection with this and on a recommendation made by the Labor Emigration Commission, a reconnaissance has been carried out for a railway to a point on the Ganges opposite Sahibgunge, and is still under consideration.

Engineering Department.

Ballasting.—The new ballast siding, which was laid at Mundaghat below the Jalpaiguri station, was finally closed in October 1880. 230,000 cubic feet of ballast were carried and spread on the Teesta Extension, and 12,470 cubic feet on the Jalpaiguri subdivision.

Stations and Offices.—The corrugated iron goods-sheds at Panchbibi and Chaitangram were dismantled, and the materials utilised in building Sultanpur and Nawabganj goods sheds respectively. Two corrugated iron goods sheds—one at Domer and one at Saraghat—were completed.

The pucca stations at Raninagar and Nawabganj were completed, and in that at Chilahati brickwork was done up to 11 feet.

The arrangements for lighting all the stations were completed.

Chaitangram station has been closed and abandoned, except as a flag-station experimentally.

The covered way at Siliguri was also extended 70 feet for the Tramway.

Jaipur passenger platform has been extended 250 feet and that at Haldibari 100 feet, so that trains can now water at both ends of these stations. Orders have been issued for a similar extension of the Nattor platform.

Staff quarters.—The walls of first class bungalow No. 1 at Sara were taken down and rebuilt.

Almost all the bungalows on the line have been provided with wire ladders and iron gurrahs, to be used in cases of fire.

Sub-Inspectors' quarters have been built at Nattor, Parbatipur, and Jalpaiguri.

Better accommodation for the Traffic menial staff, with brick walls, has been provided at Gopalpur, Malanchi, Nattor, Nawabganj, Jaipur, Hili, Birampur, Phulbari, Badarganj, Shampur, Rangpur, Kaunia, and Darwani.

Police accommodation at Gopalpur, Nattor, Nawabganj, Jaipur, Hili, Birampur, Phulbari, Badarganj, Shampur, Rangpur, Kaunia, and Darwani has been provided.

Station machinery.—A second water column has been put up at Nattor, at Jaipur, and at Haldibari, and connected to the water-supply. Ashpits for these water columns have been built.

The second engine stable and a second jib-watercrane at Saidpur were completed; also Siliguri turntable.

An additional pucca well was sunk 50 feet at Saidpur for water-supply to the workshops, and a tower built to support the up-cast and down-east pipes. A carriage inspection pit under the platform siding at Saidpur was built 500 feet long.

Bridging.—Seven of the additional bridges on the southern portion of the line have been completed.

Fencing.—One hundred and eleven miles of stone-posts, carrying four strands of wire, have been erected on the main line, 16 miles on Rangpur Branch, and 26 miles iron standard fencing, four wires, on the main line, from 170th mile to Siliguri.

Quarters for other Departments.—At the request of the Postal authorities, a Post Office was commenced at Parbatipur and was almost ready on the 31st March.

Damukdea temporary extension.—A fair weather line, 3·886 miles in length, was laid upon the *chur* of the river Ganges from the Damukdea station to the other side of Saraghat for the purpose of shortening the run of the steam ferry.

Additional sidings were provided at the following stations for the convenience of goods traffic:—

	Feet.
Hili	820
Saidpur	700
Phulbari	560
Birampur	506
Atrai	2,600

The temporary siding at Kaunia had to be taken up and another running northwards was laid down on account of the river Teesta changing its course.

One hundred and seventy rails out of 117,132 laid in road, and 3,783 timber and 13 iron sleepers out of 504,477 and 19,517 respectively, have been renewed during the year.

The permanent-way and buildings generally have been maintained in good order throughout the year.

Locomotive Department.

Running engines.—The total number of engines working during the past year was 40.

Engine failures.—The number of engine failures during the year have been 15. Of these, 10 were caused by valves slipping, which has at last, after numerous trials, been obviated by an alteration in the buckles; 2 were caused by the regulator spindle breaking—this is also being cured by an alteration in the regulator; and the other 3 failures were due to mismanagement on the part of the drivers.

The percentage of working expenses of this department as compared with the gross receipts have fallen steadily since the line was opened, as will be seen from the following statement :—

			Locomotive.	Carriage and Wagon.
			Rs.	Rs.
Half-year ending	30th June	1878 ...	19·59	4·19
„	31st December	„ ...	25·80	5·20
„	30th June	1879 ...	22·68	2·97
„	31st December	„ ...	22·24	3·04
„	30th June	1880 ...	18·28	2·83
„	31st December	„ ...	13·93	1·85

The cost of coal also has fallen greatly, owing to the arrival of additional flats at Sara, so that tonnage could be spared from public traffic for carriage. There is at present therefore no charge for country boating across the river, which was an expensive item in the past. There has also been the advantage since March 1880 of a weighbridge at Sara, so that the coal has been taken over by weight instead of measurement, which has resulted in a saving of at least 18 per cent., as will appear from the following statement :—

Month and date.	Total consumption before weighbridge opened.				Total consumption per train mile before weighbridge opened.				Month and date.	Total consumption after weighbridge opened.				Total consumption per train mile after weighbridge opened.			
1880.	Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.	1880.	Tons.	cwt.	qrs.	lbs.	Tons.	cwt.	qrs.	lbs.
January ...	864	13	2	8	0	0	0	41	April ...	639	13	2	21	0	0	0	31
February ...	786	17	3	2	0	0	0	41	May ...	694	19	0	0	0	0	0	32
March	793	19	3	3	0	0	0	36	June ...	693	2	2	6	0	0	0	35

Premia for economy in the consumption of coal and oil have been offered on the line since January 1879; but since the introduction of the engine coefficient of six vehicles, under the instructions contained in Government of India circular No. 18 of 1880, no premium has been earned by any driver, and the Locomotive Superintendent considers it would be advisable to increase the engine coefficient from six to ten vehicles.

The repairs to engines have been much lower in this than in the two previous years, as the benefits of certain alterations which were made thereon and charged to Revenue are now making themselves apparent.

The number of engines repaired during 1879-80 as compared with 1880-81, and the total and average cost per engine of the repairs, are shown in the following table :—

	Number of engines repaired.	Total cost.	Average cost per engine.
		Rs. A. P.	Rs. A. P.
From April 1879 to March 1880	35	22,972 9 7	656 5 0
„ „ 1880 to „ 1881	39	13,484 15 11	345 12 0

The class of repairs effected for the two years are also shown below :—

Class of repairs during 1879-80.	Number of engines repaired.	Class of repairs during 1880-81.	Number of engines repaired.
Heavy	7	Heavy	4
Middling	5	Middling	11
Light	4	Light	1

The cost of repairs for this year and the next will stand higher, as we have already to commence re-tyring the engine wheels; and this is an important item, as all the engines will require new tyres simultaneously.

The F class engines have altered the working advantageously, as two of these engines do the work of three E class engines, thus considerably reducing train mileage and wages.

The conduct of the staff has been generally very satisfactory, and the health of the Europeans, since they have been comfortably housed, has greatly improved. The health, however, of the native employés, especially those in the workshops, is very far from satisfactory, as many as 30 per cent. having been on the sick list at one time in December, January,

and February last, attributable to the want of proper shelter, which the men neglected to provide for themselves. The point is, however, receiving attention, and it is proposed to provide them with quarters, charging a moderate rent.

Carriage and Wagon Department.

The following additions and alterations have been made to the stock during the year:—

Number of vehicles.	Class of vehicles.	Remarks as to additions and alterations.
3	Luggage vans	Converted into 18 feet long covered wagons.
80	Low-sided wagons with iron underframe	,, open jute wagons.
11	Family saloons	Fitted with sliding seats.
4	Ordinary third class carriages	Built on the lames of carriage trucks.
2	Third class carriages on bogies	Built.
35	Low-sided wagons with wood underframe	Fitted. Built with centre buffers.
23	Eighteen feet long covered goods wagons	Ends closed.
3	Travelling cranes	The greater part of these had been lost in the river. These were rebuilt.

All the dead-buffer ballast wagons have been fitted with central couplings.

All 1st and 2nd class stock and several other vehicles have been fitted with screw couplings designed by Mr. Rendell, which are giving complete satisfaction.

Workshops.—These have made great progress. The following buildings are now permanently occupied:—Stores, smithy, machine shop, boiler and erecting shop, and paint shop.

The whole of the machinery have been laid down in the machine shop, and it only remains to put up the shafts for the boiler and carriage shops and to lay down the machines in these shops. The overhead cranes for the erecting and boiler shops and the boilers for the engines of the machine shop have not arrived from England yet; but at present a locomotive boiler is used for working the engines as a temporary measure, which will be done until the boilers arrive.

There are, of course, numerous minor works to be done to finish the shops, but the greater part has been completed.

The total value of work done in the shops during 1880-81 has amounted to Rs. 1,12,677-14 on a total number of orders, 1,633, as compared with Rs. 1,56,302-4-8 on a total number of orders, 1,634, in 1879-80.

The work done is as follows:—

	1879-80. Rs.	A.	P.	1880-81. Rs.	A.	P.
Capital	41,663	9	11	51,837	2	0
Plant	4,108	15	3	589	9	1
Locomotive	24,564	10	10	14,721	9	11
Carriage and Wagon	9,370	10	0	9,437	2	1
Engineering	14,321	12	10	7,989	2	6
Other departments	48,529	2	2	23,718	13	2
Private parties	1,522	13	10	1,782	6	9
Total ...	1,44,081	10	10	1,10,075	13	6
Uncompleted orders on the last day of the official year, carried forward to next year.	12,203	4	6	2,619	6	10

A number of young men and lads have been collected from the villages round and are being taught machine work, to which they take readily; but the difficulty is to keep them steady in their attendance, especially during the time when agricultural operations are most active.

A night school has been started for the benefit of these lads, and for any of the adult native firemen and drivers who may wish to attend.

Stores Department.—A very large quantity of surplus stores was sent to the Port Storekeeper, Calcutta, for disposal, and a considerable quantity was also transferred to other Railways. In January 1881, when Mr. Devine took leave, it was considered advisable to place the department under the charge of the Locomotive Superintendent, for whose department most of the articles remaining on hand are required.

The Locomotive Superintendent has a small establishment for the purpose of issuing the stores and keeping the necessary books, and a saving of Rs. 418 per mensem has been effected by the change.

The stores were verified during the year, and the discrepancies found were few in number and trifling in amount.

The stores balance was reduced by Rs. 3,49,222 during the year, of which Rs. 1,09,305 was due to sales and transfers of surplus materials to other Railways and departments, and the rest (Rs. 2,41,917) to issue to Revenue and Construction works.

Traffic Department.

The gross traffic receipts as compared with 1879-80 are as follows—

Traffic earnings.	1879-80.	1880-81.	Increase in 1880-81.	Decrease in 1880-81.
	Rs.	Rs.	Rs.	Rs.
Coaching traffic	5,00,353	5,17,951	17,598	...
Goods traffic	7,46,268	8,45,320	99,052	...
Telegraph	6,884	6,254	...	630
Sundries	91,910	95,840	3,930	...
Total ...	13,45,415	14,65,365	1,20,580	630

which gives a net increase of Rs. 1,19,950, or 8 per cent. over the amount earned in 1879-80. The earnings under the head "Steam Boat Service" will be separately dealt with, as the service has been constituted a distinct department.

The details of coaching traffic are as follows :—

Description of traffic.	1879-80.		1880-81.		Increase in 1880-81.		Decrease in 1880-81.	
	No.	Amount.	No.	Amount.	No.	Amount.	No.	Amount.
		Rs.		Rs.		Rs.		Rs.
First class ...	2,989	31,202	3,336	37,100	347	5,898	...	...
Second class ...	6,822	26,216	5,305	25,698	...	...	1,517	1,118
Intermediate ...	...	...	18,062	35,528	18,062	35,528	...	...
Third class ...	671,363	3,77,551	666,114	3,69,193	...	...	5,169	8,358
Luggage and parcel ...	...	38,092	...	25,671	...	...	...	12,421
Horses, cats, and dogs	...	11,021	...	7,620	...	...	...	3,401
Special train ...	...	2,982	...	2,352	...	...	...	630
Miscellaneous ...	...	13,289	...	15,389	...	2,100	...	...
Total ...	681,174	5,00,353	692,897	5,17,951	18,409	43,526	6,686	25,928

These figures show a net increase of Rs. 11,723 in the number carried and of Rs. 17,598 in the amount received as compared with 1879-80.

The following statement gives the details of merchandise earnings :—

	1879-80.		1880-81.		Increase in 1880-81.		Decrease in 1880-81.	
	Tons.	Rs.	Tons.	Rs.	Tons.	Rs.	Tons.	Rs.
Merchandise, general ...	98,206	7,43,913	121,797	8,42,313	23,591	98,400	...	...
Live stock, &c. ...	...	92	...	790	...	698	...	...
Demurrage ...	...	2,263	...	1,716	...	...	...	547
Miscellaneous ...	...	...	...	501	...	501	...	...
Total ...	98,206	7,46,268	121,797	8,45,320	23,591	99,599	...	547

From the above it will be seen that Rs. 99,052 more were earned in 1880-81, which gives an increase of 13 per cent. over 1879-80.

The following table shows the weight of the principal commodities carried as compared with 1879-80, together with the variations under each head :—

Commodities.	For the year 1879-80.	For the year 1880-81.	Increase in 1880-81.	Decrease in 1880-81.
	Tons.	Tons.	Tons.	Tons.
Ale	464·66	533·25	68·59	...
Food-grain	28,632·75	39,134·35	10,471·60	...
Ginger	419.95	404·96	...	14·99
Gunny bags	1,658·71	2,369·95	711·24	...
Jute	25,809·66	24,797·06	...	1,012·60
Piece-goods	4,551·40	5,190·56	639·16	...
Railway material	2,926·28	4,454·63	1,528·35	...
Salt	6,492·72	11,256·66	4,753·94	...
Sugar	978·66	1,097·46	118·80	...
Tea	2,916·61	4,279·28	1,362·67	...
Tobacco	5,212·56	10,158·30	4,945·74	...
All other goods	18,112·04	18,130·54	18·50	...
Total ...	98,206·00	121,797·00	24,618·59	1,027·59

From the foregoing it will be seen that 23,591 tons more were carried in the year under review, being an increase of 24 per cent.

The monthly traffic reports give full details of the causes for the increases and decreases, which may here be briefly summarised as under :—

Decrease.

Tons.

Jute ... ... 1,012·60

This decrease calls for special notice, as the large area which was under cultivation with this staple last season and the consequent increased production should, under ordinary circumstances, have resulted in a considerable increase instead of a decrease; but a variety of causes have been at work to bring about this unfavorable result. In the first place, the traffic at the opening of the season was undoubtedly checked by the action of the Eastern Bengal Railway in increasing the rate from half to two-third pie per maund per mile. That this enhanced rate actually had the effect of driving large quantities of jute from the rail to the rivers is proved beyond doubt by the figures given in the monthly traffic reports and from evidence obtained by enquiries made at the time. Then came the effect of the large increased production on the market, which naturally caused a fall in the price at the port and the consequent gradual diminution of despatches :—

Increases.

Tons.

Food grains ... ... 10,471·60

The traffic in this staple (principally rice) has kept up in a very remarkable way, considering the almost unprecedentedly low price at which the article has been selling throughout the year at the port.

Tons.

Gunny bags ... ... 711·24

This increase is the natural result of the low rate at which the raw material (jute) has been selling this season as compared with last.

Tons.

Salt ... ... 4,753·94

The low rate introduced in October 1878 has proved, by the results obtained, to have been a most judicious measure, for the traffic is steadily being diverted from the rivers to the rail.

In 1878-79, when the rate was one-third of a pie per maund per mile, 235·82 tons were carried. In 1879-80 the weight rose to 6,492·72 tons, when the rate was reduced to one-fifth pie per maund per mile, and for the period under review the quantity carried has reached 11,246·66 tons.

Tons.

Tea ... ... 1,362·67

This increase is accounted for by the larger quantity produced during the season 1880-81 over that of 1879-80.

Tons.

Tobacco ... ... 4,945·74

The large increase in the weight of tobacco carried is another proof of the judicious policy of reducing rates to a level which enables the rail to compete with the waterway, which for a great part of the year taps the principal goods marts served by the Railway.

Changes in Rates, &c.

(1) On and from 1st August 1880 minimum weight for special class goods was fixed at 100 maunds instead of 200 maunds.

(2) On and from 1st August 1880 three pie handling charge was added to through and two pie to local rate.

(3) On and from 11th August 1880 a special through rate of 10 annas per maund came in force for tobacco from Kaunia, Rangpur, and Domer.

(4) On and from 15th August 1880 through booking with Darjeeling Steam Tramway Company was introduced.

(5) The through booking of goods with Kaunia and Dhubri service was introduced from September 1880.

(6) On and from 1st November 1880 coolies were booked through from Raneegunge (East Indian Railway station) to Kaunia at a through fare of Rs. 4-13-9.

(7) On and from 1st November 1880 minimum of insurance was fixed in through booking.

(8) On and from 1st November 1880 grain and pulses were included under the head of foodgrains and charged at special rate of quarter pie per maund per mile when carried for distances over 70 miles.

(9) On and from 1st January 1881 Commissariat stores have been charged at half and Ordnance stores at five-sixth pie per maund per mile.

(10) On and from 1st January 1881 Chaitangram station was closed for traffic; it has subsequently been opened as a flag-station.

(11) On and from 1st February 1881 through booking of goods and parcels was introduced with East Indian Railway and connected lines.

(12) Loading and unloading of goods at Sara was done during the year by a native contractor.

Claims.—The gross amount paid as compensation during the year was Rs. 30,448, which may be classified as under—

	Rs.
Pilferage	98
Robberies	696
Misdeliveries	81
Damage, &c.	29,573
	30,448

but the actual amount charged in the accounts was only Rs. 6,999, the difference, Rs. 23,449, having been recovered by the sale of the damaged and unclaimed goods, &c.

The principal item in the above was on account of compensation for jute damaged by a heavy and sudden storm which came on while a large consignment was crossing the Ganges ferry.

During 1880-81 the staff have been better housed than in previous years, and in consequence ill-health, resignations, and other casualties have been much reduced. A few stations, notably Chaitangram, Birampur, Parbatipur, Chilahati, and Shikarpur, still remain extremely unhealthy, and are the source of much trouble, thereby necessitating constant transfers of the staff.

In previous years great difficulty was felt in obtaining competent subordinates for the Traffic Department. To obviate this, youths selected from the Jalpaiguri, Rangpur, and Pubna schools were appointed as probationers and trained in stationmaster's work and telegraphy.

This plan has succeeded admirably; for, during the period under review, only one outsider (a stationmaster) was appointed to the department.

The men trained under this system are more amenable to discipline, have a reluctance to leave the line on which they have been taught their work, and above all serve for less pay than those appointed from other lines.

After long negotiations and much correspondence, the through booking of goods with the East Indian Railway and connected lines was finally arranged and carried into effect on 1st February last. The difficulty in getting a reliable firm to take up the transport between Armenian Ghat, Eastern Bengal Railway, and Howrah, East Indian Railway, nearly caused this

important matter to fall through ; but Messrs. Burn & Co. of Calcutta at last took up the agency and thus completed the link alone wanted to place stations from Darjeeling to Sara in through booking communication with all India.

The police employed at the stations were under the control of the superintendents of the various districts through which the line passes ; and during the year under review the men employed in the watch and ward of goods were placed under the same supervision.

The system is not altogether satisfactory, and proposals for the appointment of a responsible Railway Police officer with powers in all the districts are under consideration.

The strength of the Medical Department was as follows :—

1 medical officer,
1 assistant surgeon,
5 hospital assistants ;

and for three months of the year an extra hospital assistant was engaged for fever cases.

The number of dispensaries on the Railway was the same as during the previous year, namely, four at Sara, Kaunia, Saidpur, and Siliguri. They met adequately the requirements of the line.

In the treatment of intermittent fever the Darjeeling febrifuge has been used with much success, although at first both Natives and Europeans were strongly prejudiced against its use.

The health of the European and Eurasian employés was good ; but there was a large number of fever cases among the Natives, especially at the beginning of the cold weather. This is believed to have been due to want of warm clothing and to the inferior description of houses in which some of them, especially the menial staff, resided.

The following are the principal points worthy of note in connection with the accounts :—

Capital.—The total outlay on Capital account from commencement to the close of the year 1880-81 on final heads is Rs. 2,03,73,083 against the sanctioned estimate of Rs. 2,05,62,301.

The suspense balances were reduced during the year by Rs. 3,67,470, and now stand at Rs. 7,19,922. Including suspense balances, the total capital outlay amounts to Rs. 2,10,93,005, the interest on which from commencement at 4½ per cent. amounts to Rs. 40,31,382, the net revenue being Rs. 12,21,483, thus giving a deficit of Rs. 28,09,899.

These calculations, however, include interest on capital for the whole period the line was under construction from 1869-70 to 1876-77. On the opening of the line for traffic in 1877-78 the net revenue returned ·04 per cent. on the outlay. In 1878-79 it increased to 1·01 per cent., in 1879-80 to 1·15 per cent., and in 1880-81 to 3·69 per cent.

Revenue.—The estimate of earnings was put down at Rs. 15,78,000 in the Budget Estimate, but was increased in the Regular Estimate to Rs. 16,30,000, the actuals being Rs. 16,34,588.

The net earnings were orginally estimated at Rs. 4,68,000. They were, however, increased in the Regular Estimate to Rs. 6,98,000, against which the actuals were Rs. 7,09,443—a result which has been arrived at mainly by the exercise of the closest economy and financial vigilance in all departments.

The percentage of expenses to earnings has been 56·60, which for a line only four years open for traffic will, it is hoped, be considered satisfactory.

Steam Boat Service.—Up to the 1st November 1880 the arrangements in connection with the Sara Flotilla were under the supervision of the Traffic and Locomotive Superintendents. From that date the working of the ferry was placed under an Assistant Traffic Superintendent, and constituted a separate department.

The following steam vessels were employed during the year :—

Names of steamers.	Horse-power.	Remarks.	No. of flats.	Tonnage.	Remarks.
				Tons.	
Prince Albert	175	.....	Flat A1 ...	272·3	
			„ A2 ...	272·3	
Poppy	110	Left Sara for Calcutta for repairs on 29th December 1880.	„ A3 ...	272·3	Arrived in April 1880.
			„ A4 ...	272·3	Arrived in October 1880.
			„ B1 ...	95	
			„ B2 ...	95	
			„ B13 ...	95	
Lilly (Steam-launch) ...	20	.....	„ B14 ...	95	
			„ C1 ...	51	
Osprey	93	Arrived on 16th October 1880. Supplemented by native boats or "cuttras."	„ C2 ...	51	

The following flats were also in use :—

Names and description of vessels.	Horse-power.		Registered tonnage.	Remarks. (Additions or decrease; changes in number or employment.)
	Nominal.	Actual.		
Flat Isla, decked and roofed	...	...	381	Staging at Sara Ghat and offices.
„ A1, „ „	...	...	260	
„ A2, „ „	...	...	260	
„ A3, „ „ and fitted with four cargo posts.	...	...	260	

In addition to the above, the steamer *Vampire*, sister ship to the *Osprey*, arrived at Sara on 14th March, but was not put into commission till after the close of the year.

Tirhoot Railway.

The year under review has been one of increased prosperity, and the financial success of the Railway may now be considered as established. It is gratifying to see that this has been attained within so short a time of the opening, and it clearly demonstrates the fact that in rich and highly cultivated districts, such as Bengal, railways have only to be well managed to pay handsome interest on the capital expended, in addition to the indirect gains that must attend the opening out and development of the trade and enterprise of the country. All departments of the Railway have been worked satisfactorily during the year.

The capital expenditure of the line has been limited to the erection of additional station and office accommodation, workshops at Somastipur, extra staff quarters, and the completion of the Bya bridge, part of the cost of the latter being charged to Revenue. The completion of this bridge in October enabled the temporary line over the *Dearah*, with the short ferry, to be opened two months earlier than had previously been done.

There has been only a slight increase in passenger receipts over the previous year; but the goods traffic shows a great increase in nearly all commodities, the chief being in seeds, tobacco, and miscellaneous. A still further development is anticipated on the completion of the extensions to Pipra and Bettiah.* The traffic latterly has developed so rapidly, that the existing locomotives and carriage and wagon stock have been found to be inadequate to the requirements, and the additional stock indented for is urgently required. An additional steamer of the *Eagle* class and more flats are also greatly needed for the efficient working of the ferry. Temporary arrangements have been made by hiring the Government steamer *Jaboona*; but this steamer cannot be worked on this service with economy.

* Vide Chapter III, page 45.

The total capital expended up to 31st March was Rs. 59,02,388, the outlay during the year having been Rs. 4,49,735. The net revenue earnings were Rs. 2,43,017, or 4·1 per cent. on the capital expended, as against 2·45 of the previous year. The working expenses have been reduced from Rs. 3,43,273 to Rs. 3,14,636—a satisfactory result, considering the short length of the line.

Muzaffarpur-Hajipur Project.

The survey of this extension has been completed and the preliminary project submitted. The object of the line is to connect the Tirhoot system with Patna, the trading capital of Behar. It will also work in with the line now projected by the Government of India from Gorakhpur *viâ* Sehwan and Chapra to Hajipur, a bridge being constructed over the Gandak to connect the two systems. The borings taken on this river show a hard substratum of red clay and kunkur at no very great depth, so that the foundations of the bridge can be secured without much difficulty. The importance of this line is considered so great, that endeavours will be made to obtain funds for its construction at an early date.

Engineering.—One bridge of three spans of 12 metres at Bilaspur, also a screw-pile bridge of five spans of 12 metres, and one span of 6 metres over the Bya nullah, were completed, with the exception of the Starling piles, which were well in hand at the close of the year. Several attempts were made to recover the lost piles at the site of this bridge, which belonged to the former bridge carried away in the floods of 1879; but in consequence of their being imbedded in a quicksand, all attempts failed, and the work has now been given up as useless and likely to cause an expenditure greater than the value of the piles.

The permanent-way was kept in good order throughout the year. Several renewals of creosoted pine sleepers were made, these being replaced by sal sleepers. These pine sleepers are not at all satisfactory; their prime cost is no doubt cheap, but they are very short-lived, and the wood soon splits up—a result no doubt greatly due to the amount of sapwood in the sleepers. A more judicious selection of sound timber at home would doubtless give better results; but as long as sleepers of the present quality are sent out from home, the use of them cannot be recommended.

The following experimental iron sleepers are being laid in the road, and will be duly reported on:—

Denham and Olphert's patent plate sleeper with wooden cushion.
" " plate sleeper without cushion and with moveable jaw clip.
" " " with Molesworth's wedge fastening.

It is satisfactory to find that, although the permanent-way gangs were reduced from 29 to 18, the maintenance of the road was in no way impaired thereby. By decreasing 11 gangs and the wages of the gatekeepers by one rupee all round, a great saving has been effected under the head "Maintenance—Wages."

No serious accident affecting the permanent-way occurred during the year.

On the completion of the locomotive smithy shop the machinery was transferred there from the temporary shops; and in consequence of the present building not affording sufficient accommodation for all the machinery, an addition is now under construction, together with a locomotive store and a tin-smith's shop. A large new carriage shop was also commenced towards the end of the year.

Little work was done on the new institute in consequence of want of funds.

A tank and pump were erected at Bazitpur at a cost of only Rs. 1,152, or for a considerably less sum than the ordinary types have hitherto cost. The tanks, which are six in number and 4 feet square, are supported on T iron posts firmly braced together. The whole erection is very simple and inexpensive.

TRAFFIC.

The results of the year's working are satisfactory. The work done may be thus summarised:—

		Number or weight.	Earnings.
			Rs.
Coaching	No.	473,276	2,22,027
Goods	Mds.	21,62,425	2,09,912
Sundries		...	22,946
Steam Boat		...	1,02,766
Gross earnings			5,57,651

being an increase of Rs. 87,956, or 18 per cent. over the receipts of 1879-80.

The percentages of increase under different heads are—

	Number.	Receipts.
Coaching	·03	11
Goods	·42	26
Sundries		—15
Steam Boat		34

The coaching traffic, divided into classes, shows the following results:—

	Number.	Receipts.
		Rs.
First class	3,143½	10,428
Second "	3,468½	7,118
Third "	455,788	1,87,960

Under goods traffic the quantities of the principal commodities carried over the line as compared with the previous year are —

	1879-80.	1880-81.	Percentage of increase and decrease.
Seeds	2,29,285	3,44,402	50
Hides	83,138	54,025	—35
Saltpetre	1,41,745	89,291	—37
Foodgrains and pulses ...	3,23,751	4,09,612	27
Salt	2,42,128	3,02,874	25
Piece-goods	1,04,138	1,20,424	16
Tobacco	88,695	1,24,093	39
Indigo	16,502	37,792	129
Other goods	2,85,082	5,50,996	93

Of the total through goods carried, 6,73,124 maunds were outwards and 6,47,478 maunds inwards; and the proportion of empty to full running 24·67 per cent.

The earnings per train mile were Rs. 3·50.

The chief alterations in the rates have been—

(1) rate for indigo seed reduced from 4 to 2 pies per station distance;

(2) rates for a consignment of less than 140 maunds of salt, railway materials, and bones increased from 2 pies per maund per station distance to 4 pies per maund over ferry and 3 pies per maund over railway;

(3) rates for consignments of or over 140 maunds of salt, &c., increased from 2 to 4 pies over ferry.

The amounts paid as compensation for loss, damage, or misdelivery of goods are thus classified:—

	Rs.	A.	P.
Robberies	7	1	0
Damages by rain, &c.	65	14	6
Misdelivery and other causes	13	0	0
Total	85	15	6

As compared with Rs. 1,271 paid as compensation during the previous year, and considering the difficulties attending the double transhipment of goods at the ferry, this speaks well for the management of the department.

Monthly meetings of merchants have been established at Durbhanga and Muzaffarpur to listen to any complaints or suggestions they may have to make; and this has tended to create a good feeling between the mercantile public and the Railway resulting no doubt in considerable benefit to all concerned.

Locomotive and Carriage and Wagon.—There are ten engines working on the line. During the past year there were five failures, and three engines had heavy repairs done to them. A great increase in repairs has taken place since the speed was accelerated from 18 to 20 miles per hour.

The average consumption of coal was 28·15 lbs. per train mile, and of oil 8·59 pints per 100 miles, as compared with 36 lbs. coal and 11½ pints oil of the previous year.

There are 60 carriages and 252 wagons on the line, including a state saloon, which has been built in the East Indian Railway shops, Howrah. Fifty ballast wagons are to be constructed for the extension in the Somastipur shops.

The machinery has all been removed from the temporary workshop to the new building, and is now working. An addition to the shop has been begun for woodwork, machinery, iron foundry store, and tin-smith's shops.

The new smithy is almost ready; the hearths and steam-hammer have been erected. The only thing now to be erected is the blast fan.

The carriage shop has also been begun, which, when finished, will prove of great use, as the present one is quite inadequate for the requirements.

The cost per mile is thus analysed :—

	1879-80.	1880-81.
	Rs.	Rs.
General superintendence	·05	·05
Running expenses	·19	·17
Fuel	·17	·18
Water	·02	·02
&c.	·11	·12
	·54	·54

the total expenditure being the same in 1880-81 as in previous year.

Steam Ferry.—The new steamer *Eagle* has been running since August 1880, and has given great satisfaction. Another one of her type is required to make the working of the ferry complete, as neither the *Barrh* nor *Phlox* is fit for such a purpose. The *Barrh* has been hired to the Saran Road Cess Committee.

Tirhoot Railway Extensions.

Work on these lines was commenced in March 1881, the contract for the Bettiah Division, 75 miles, being given to Messrs. Burn & Co., contractors, and the Pipra Division, 28 miles, to Mr. P. B. Johnson, contractor of Allahabad.

As previously stated in the general summary, the estimates of these extensions will be somewhat exceeded, as in the original estimate no provision was made for ballasting the lines except in the station yards, and it has since been decided to lay brick ballast throughout. The contractors' rates, too, are slightly in excess of estimate.

The whole of the stores, permanent-way, rolling stock, and materials required from England have been indented for and deliveries have already commenced. Seventy-one miles of the permanent-way will be laid with iron plate sleepers of the Denham-Olphert's pattern and the balance of sal.

Patna and Gya Railway.

The progress of this line has been so far very satisfactory, it having already paid Rs. 17,535 over the interest, and with every prospect of increased prosperity in the future. Ballasting has been the only Capital work of importance during the past year, and it is now nearing completion. A siding of about 2 miles was laid down to the Ramsilla Hill for ballast, and will be removed when no longer required. The capital outlay to the end of the financial year was Rs. 35,78,442, of which Rs. 3,09,812 has been expended during the year.

The passenger traffic has increased from 267,119½ to 519,696; and the goods from 28,45,078 to 32,20,951 maunds—figures which give a fair hope of future increase.

The net revenue earnings were Rs. 2,19,755, or 6·1 per cent. on the outlay, the working expenses being 55 per cent. of the gross earnings. It must be remarked that the line has so far been working under great disadvantages, owing to the heavy charges for the hire of rolling stock; and although the passenger stock has been increased, there still remains the very heavy item for hire of engine and goods stock. The management in all departments has been satisfactory. No serious accident occurred during the year.

Engineering.—The condition of the line has greatly improved since the last report. Large expenditure has been made in ballast, and the following additional Capital works have been carried out during the year—store-shed at Gya; goods-shed at Jehanabad; stationmasters' quarters at Bella and Chakund; running-room at Bankipur; foreman's quarters at Bankipur and Gya, including out-houses; ballasting whole line, including siding, to Ramsilla Hill; fencing Gya yard; erecting waiting-shed, &c., at Poonpoon; fencing Bankipur station.

Traffic Department.—The results of the working are as follows :—

		Receipts.
		Rs.
Coaching	... No. 545,222½	3,49,678
Goods	... Mds. 15,74,081	1,43,781
Sundries	... ...	3,018
	Gross earnings	4,96,477

against Rs. 3,44,990 for 1879-80, or an increase of 44 per cent.

There is an increase of 39 per cent. in number, and 42 per cent. in receipts, on the coaching traffic; and the following statement shows in comparison the chief commodities carried over the line in 1879-80 and 1880-81 per cent :—

	1879-80.	1880-81.	Percentage of increase or decrease.
	Mds.	Mds.	
Seeds	1,02,102	2,08,900	105
Hides	21,480	12,107	—44
Saltpetre	9,071	6,112	—33
Foodgrains and pulses	4,41,319	3,10,272	—29
Salt	1,79,736	1,56,920	—13
Piece-goods	30,225	29,052	—4
Tobacco	31,017	31,369	1
Indigo	37	54	46
Other goods	48,639	7,81,361	1,506

The chief increase is seen to be in seeds and other goods. As on the Tirhoot line, there is a considerable falling off in hides and saltpetre, due, it is believed, to the temporary stagnation in this trade.

The figures below give the classification of the coaching traffic :—

	Number.	Receipts.
		Rs.
First class	1,164½	4,684
Second „	3,560½	6,385
Third „	526,272	3,23,282

The through traffic with the East Indian Railway was—

	Mds.
Inwards	3,72,198
Outwards	4,78,397

and the proportion of empty to full running is 22·65.

The earnings on the lines were Rs. 4·35 per train mile as compared with Rs. 4·67 for the previous year.

The rates for both goods and passengers are assimilated to those of the East Indian Railway.

The amount paid in compensation for loss, damage, or miscarriage is Rs. 16-5 only.

The terms for working the joint station at Bankipur have not yet been agreed upon, and are under consideration.

No serious accident occurred during the year; those affecting life or limb are summarised as follows :—

Passengers killed	*Nil*
„ injured	*Nil*
Railway servants killed	3
„ „ injured	*Nil*

Locomotive Department.—The total number of engines working during the year was eight. Three of a heavier class from the Calcutta and South-Eastern Railway were obtained, and two of the lighter class returned.

There were six engine failures, four caused by tubes bursting, one through regulator valve getting jammed, and another by pumps failing.

The average consumption of coal was 51 lbs. per train mile, and of oil 12·95 pints per 100 miles.

The workshop and machinery have not yet been erected; but the latter is expected from England shortly. Consequently all wheels requiring turning have to go Jamalpur, and petty repairs to Somastipur, which increases the cost and time taken to effect them.

Several new carriages have been added to the stock, *viz.*, five firsts, four seconds, thirty thirds, and four brake-vans ; consequently no hiring of carriages is now necessary from the East Indian Railway. The total stock now consists of five firsts, four seconds, forty thirds, seven brake-vans, twenty ballast trucks, and eighty-two wagons. Of these, sixty-five vehicles are hired from the Calcutta and South-Eastern Railway. Heavy repairs are being done to the old third class carriages (bought from the Eastern Bengal Railway when the line first started), owing to their requiring new springs and axle-boxes ; double roofs and sunshades are also being added. Seven ballast wagons have been rebuilt, and thirteen others have had heavy repairs done to them.

Calcutta and South-Eastern Railway.

The line has been maintained in good order, and the traffic worked without interruption. The condition of the permanent-way has been considerably improved, the line more fully ballasted, and the quadrennial repairs to bridges, stations, and buildings put in hand and nearly completed. Several of the girder bridges were found to be under the required strength, and the work of strengthening them has been commenced. The coaching and goods stock has been kept in efficient order ; but more engines are greatly needed, as those at present on the line are old, cannot be relied on, and require constant heavy repairs. Four more engines have been indented for, and may be expected by the end of 1881-82.

Rs. 96,000 was paid for the purchase of the godowns from the Oriental Jute Company, thus making the capital expenditure to the end of the financial year Rs. 68,19,771.

The results of the year's working cannot be considered satisfactory ; for, whereas on the Northern Bengal, the Tirhoot, and Gya Railways the receipts show improvements under nearly all heads of receipt, on the Calcutta and South-Eastern there is a slight decrease in goods, a serious falling off in coaching, and an increase only under sundries, which is exceptional, being due to the hire of stock to the Patna and Gya Railway. The gross receipts for the year were Rs. 1,42,098, the expenses Rs. 1,01,344, and the net profits Rs. 40,754, or ·60 on the outlay as compared with ·54 in the previous year. The working expenses were 71 per cent. of the gross earnings.

Extensions to Sonapur and Diamond Harbour.—*Vide* Chapter III, page 45.

Locomotive Department.—The line is amply supplied with carriage and wagon stock ; but additional engines are urgently required to replace the existing old and worn-out ones. The four that have been indented for from England are expected by the end of 1881-82. Of the seven engines on the line, two have been condemned and will be broken up ; another is a tank engine suitable for shunting purposes only. Therefore there remain only five for working the traffic, and of these two require heavy repairs.

Of the carriage and wagon stock, the following are still on the Patna and Gya Railway :—

2 brake-vans.	20 ballast wagons.
1 horse-box.	1 carriage truck.
40 covered goods.	1 cattle van.

The conversions and alterations on the line have been—

18 higher-sided wagons converted into covered goods.
1 covered goods converted into goods brake-van.
29 covered goods wagons refitted with corrugated iron roofs.

Ten ballast wagons are under construction for the Diamond Harbour Extension, and will be completed shortly.

Traffic.—The work done during the year is thus summarised :—

		Receipts. Rs.
Coaching	... No. 595,803	76,871
Goods	... Mds. 31,934	34,155
Sundries	... ...	31,072
Gross earnings ...		1,42,098

The percentage of increase and decrease as compared with 1879 are—

	Rs.
Coaching	—7·84
Goods	— ·8
Sundries	+91·40
Total ...	+ 6

The large amount under sundries is due to the receipts for the hire of rolling stock to the Patna and Gya Railway.

The passenger traffic is divided into classes as follows:—

	Number.	Receipts. Rs.
First	429	491
Second	4,353	2,085
Third	444,644	58,594
Garden-produce vendors	146,377	13,028
Total ...		74,198

The chief staples carried were—

	1879. Tons.	1880. Tons.	Percentage of increase or decrease.
Firewood	17,257	20,552	19
Hay	3,518	3,126	—11
Wooloo	702	657	— 6
Straw	781	568	—27
Paddy	1,469	905	—38
Rice	4,388	4,506	3
Miscellaneous	1,667	1,621	— 3

Hitherto the goods traffic on the line has been mainly of a very light and bulky description, carried over short distances and at hardly paying rates. It is believed, however, there will be a considerable increase in the rice traffic from Port Canning during the current year, Mr. Schiller having reopened the rice mills in February 1881, with the declared intention of working them on an extensive scale. In consequence of this, an experimental extra train is run to Canning on Saturdays, and from there on Mondays.

The third class passenger rate was reduced in July 1879 to 3 pies per mile, but the results have not borne out the anticipated increase in numbers.

The discontinuance of the 3 o'clock train may have caused a slight falling off of receipts from garden-produce vendors, but it is believed not to any great extent, as they can avail themselves of the 5 o'clock train instead. The receipts per train mile were 3·96 as compared with Rs. 3·36 in 1879.

Compensation, to the extent of Rs. 165, was paid to the Port Canning Company for damages sustained by their rice in transit. Of this, however, Rs. 52 was recovered by the sale of damaged bags. No accidents to trains or passengers of any importance occurred during the year.

Extension to Diamond Harbour.—The length of this extension is 28¾ miles. The work is being carried out from Provincial funds, under the superintendence of the Superintending Engineer, Central Circle, and is under the immediate charge of the Executive Engineer, 2nd Calcutta Division.

The section Sonapur to Magra, 15 miles, was given out under contract, on 23rd June 1880, to Messrs. Burn & Co., who, however, only commenced work in December, in consequence of some delay on the part of the civil authorities in making over the land to them.

Up to the 31st March, on the Magra section one-fifth of the earthwork was completed, most of the ironwork required for the bridges and buildings delivered, and the materials for the masonry was being collected at the sites where required. Bricks for ballast were being moulded, and the stations and offices were in hand. The permanent-way will consist of 64-lb. steel rails on cast-iron bowl sleepers, the necessary indents for which have been submitted to England, but may not be expected before November. There will not, however, be any delay on this account, as the first seven miles will be laid from surplus permanent-way material from other lines. The work, according to the contract, should be completed by the 31st May 1882.

The extension beyond Magra to Diamond Harbour will be put in hand during the current year as a feeder road, ultimately to be converted into a railway. There are no works of any magnitude on either section, the bridge over the Ustee Khal, a single span of 100 feet, being the heaviest.

Nalhati Railway.

This line is under the same management as the Calcutta and South-Eastern. Great improvement has been made in the maintenance of the way and works, and the line is now in good order. The rolling stock is old, and requires heavy repairs and large expenditure. These repairs, however, can only partially be carried out until the receipts of the Railway improve.

The results of the past year's working have been even more unsatisfactory than those of the Calcutta and South-Eastern, there having been a heavy falling off in the receipts under all heads—in the passenger traffic to the extent of 19 per cent., and on the goods 33 per cent., while the expenses have increased by 20 per cent.

The causes of this serious decrease in receipts have been more fully dealt with in the detailed narrative. To the local depression of trade it is mainly due; but the management of the line has given cause for dissatisfaction, and has no doubt been detrimental to its prosperity.

The gross receipts have been Rs. 69,925 and the expenses Rs. 73,653, leaving a net loss of Rs. 3,728 compared with a net profit of Rs. 31,181, or 8·97 per cent. on the capital in the preceding year. The Capital expenditure for the year has been Rs. 1,282, making the total Capital debit Rs. 3,48,732. The Revenue figures for both this line and the Calcutta and South-Eastern are for the calendar year instead of the financial, the information required for the preparation of the latter not having been submitted by the Manager.

Engineering Department.—During the year bridges, culverts, stations, and permanent-way have been maintained in working order, and the traffic has been carried on without interruption. Large renewals of sleepers were made, and the condition of the permanent-way considerably improved by the substitution of fish-bolts for screws, and by the addition of fang-bolts at the rail joints. 47,180 cubic feet of ballast were also laid, and the packing of sleepers well attended to.

Several of the culverts were replastered and otherwise repaired, and the timber superstructure over bridges renewed throughout. The quadrennial repairs to stations and offices were taken in hand and completed.

Locomotive Department.—There are on the line—

6 engines.
10 carriages.
25 wagons.

Of these, two of the engines have been ordered to the Akra Brickfield Tramway, leaving the total available stock 4 engines and 35 vehicles.

The stock has been maintained in fair running order; but it is now getting old, and to keep it in thoroughly good condition would entail expenditure which the traffic on the line would not warrant. During the past year heavy repairs were carried out on three engines, and slight repairs on those remaining. The covered goods wagon used as a brake-van has been entirely rebuilt, the passenger stock fitted with foot-boards, and orders issued for roof lamps to be fitted also.

Considerable reduction has been effected in the expenditure of this department, and the cost per train mile for maintenance of engines has been reduced from 2·23 annas in the first half of the year to 1·98 annas in the second, and the carriage and wagon expenses from 1·55 to ·73.

Traffic Department.—Through booking was introduced with the Eastern Bengal, Northern Bengal, and several other Railways.

The traffic bears a very unfavorable comparison with previous years. Thus in 1879 the receipts were—

					Receipts. Rs.
Coaching	...	...	...	No. 153,900	61,161
Goods	...	...	...	Mds. 14,898	29,029
Sundries	...	...	...	.....	1,590
		Gross earnings		.....	91,780
In 1880—					Rs.
Coaching	...	...	...	No. 135,091	49,281
Goods	...	...	...	Mds. 9,646	19,413
Sundries	...	...	...	.....	1,231
		Gross earnings			69,925

or a decrease under all heads of receipts—

Coaching	...	...	...	19·42 per cent.
Goods	...	...	...	33·12 „
Sundries	...	...	...	22·58 „

The expenses were in 1879 Rs. 62,010, with net profits Rs. 29,770, and 8·97 per cent. on the capital outlay, as compared with 1880 expenses Rs. 73,653 and net loss of Rs. 3,728. Thus, while the receipts fell off by 24 per cent., the expenses increased by nearly 20 per cent. A more unsatisfactory result could not be imagined.

The following figures give in detail the classification of the coaching traffic receipts in 1879 and 1880; also the quantities of the principal commodities carried over the lines during these periods:—

		1879. Weight or number.	1880. Weight or number.	Percentage of increase or decrease.
Coaching—				
1st class	...	912	595	—35
2nd „	...	6,939	2,623	—62
3rd „	...	149,048	131,872	—12
				26

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	1879. Weight or number.	1880. Weight or number.	Percentage of increase or decrease.
Goods—			
Edible or other grains ...	7,099	2,698	—62
Silk ...	384	314	—18
Metals ...	337	205	—39
Sugar ...	319	321	1
Piece-goods ...	854	796	— 7
Cotton ...	171	227	33
Seeds ...	989	437	—55
Coal ...	1,639	2,439	49
Salt ...	786	591	—25
Sundries ...	2,320	1,682	—30

To the following reasons may be attributed the falling off in the traffic on the Railway :— That the trade of Azimgunge and districts around has been unusually depressed. That the Railway has to compete with the existing low boat rates. That passengers and goods from and to Dinagepore, Rajshahye district, Rampur Bauleah, Nattor, and Pubna formerly came to Azimgunge and passed over the Nalhati Railway. Since the opening of the Northern Bengal Railway, the traffic of these districts has been almost entirely tapped by that Railway. That the silk trade, which at one time was considerable, had greatly decreased, owing to the suspension of many large silk concerns. That the abolition of a terminal charge on through goods has caused a falling off in the receipts. That the introduction of a minimum charge of 8 annas has seriously affected the receipts both for goods and passengers. The local traffic was largely composed of small consignments, which it was the custom of the merchants to take with them in the train. The Railway therefore earned not only the freight of such consignments, but also the fare of the accompanying man. Since, however, the introduction of the minimum charge, the merchants object to pay eight annas on small consignments over short distances, the mileage freight of which may only amount to one-fourth of the sum; and the Railway not only loses the freight, but also the passenger's fare. It is therefore proposed to reduce the local minimum charge to two annas.

Besides these causes, no endeavours appear to have been made to increase traffic. Wagons are not promptly supplied, and the merchants are not solicited for traffic; and to the general want of energy and interest in the work apparent throughout the staff must be attributed a large portion of the bad results. A thorough examination into the working of the line is now being carried out.

The following tabular statements show in a concise form the working of the State Railways in Bengal during the calendar years 1879 and 1880 :—

NORTHERN BENGAL RAILWAY.

Comparative Statement of Traffic for the calendar years 1879 and 1880.

Heads of Traffic.	Passengers. Number. 1879.	1880.	Increase.	Decrease.	Receipts. 1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
1st class	2,840	3,212	372	.....	29,013	35,138	6,125	.....
2nd ,, ...	6,646	5,593	.....	1,053	24,089	25,817	1,728	.....
3rd ,, ...	632,750	696,901	64,151	.....	3,47,057	4,11,930	64,873	.....
Total ...	642,236	705,706	63,479	.....	4,00,159	4,72,885	72,726	.....
Miscellaneous	.....	.....	.....	.....	41,839	59,352	17,513	.....
	Goods. Weight (in tons). 1879.	1880.	Increase.	Decrease.	Receipts. 1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
Merchandise for the public ...	81,207	113,316	32,109	.....	6,48,285	7,84,159	1,35,874	.....
Materials for railway construction ...	4,515	3,255	.....	1,260	17,170	10,409	.....	6,761
Minerals—								
For the public	1,257	1,939	682	.....	5,149	9,518	4,369	.....
For railway construction ...	859	122	.....	737	3,914	538	.....	3,376
	No.	No.	No.	No.				
Live stock	19	137	118	.....	91	791	700	.....
Rents, demurrage, &c. ...	.....	.....	.....	.....	1,893	2,584	691	.....

TIRHOOT RAILWAY.

Comparative Statement of Traffic for the calendar years 1879 and 1880.

Heads of Traffic.	Passengers.							
	Number.				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
1st class	3,087	3,142	55	.....	10,329	10,531	202	.....
2nd ,, ...	2,899	3,420	521	.....	5,869	6,989	1,120	.....
3rd ,, ...	462,515	468,815	6,300	.....	1,79,476	1,87,869	8,393	.....
Total ...	468,501	475,377	6,876	.....	1,95,674	2,05,389	9,715	.....
Miscellaneous	.....	.....	.....	.....	16,562	22,044	5,482	.....

	Goods.							
	Weight (in tons).				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
Merchandise for the public ...	50,551	69,557	19,006	.....	1,42,771	1,88,807	46,036	.....
Materials for railway construction ...	50	1,015	965	.....	99	1,553	1,454	.....
Minerals—								
For the public	1,603	3,570	1,967	.....	4,579	11,115	6,536	.....
For railway construction ...	.....	.....	.....	.....	.....	.....	.....	.....
Live stock	.....	.....	.....	.....	.....	.....	.....	.....
Rents, demurrage, &c. ...	.....	.....	.....	.....	1,211	1,865	654	.....

PATNA-GYA RAILWAY.

Comparative Statement of Traffic for the calendar years 1879 and 1880.

Heads of Traffic.	Passengers.							
	Number.				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
1st class	536	1,094	558	.....	2,325	4,621	2,296	.....
2nd ,, ...	1,968	3,701	1,733	.....	3,669	6,776	3,107	.....
3rd ,, ...	264,615	514,901	250,286	.....	159,131	3,17,313	1,58,182	.....
Total ...	267,119	519,696	252,577	.....	165,125	3,28,710	1,63,585	.....
Miscellaneous	.....	.....	.....	.....	4,328	9,682	5,354	.....

	Goods.							
	Weight (in tons).				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
Merchandise for the public ...	18,343	42,268	23,925	.....	45,317	1,12,990	67,673	.....
Materials for railway construction ...	1,702	10,326	8,624	.....	2,513	20,715	18,202	.....
Minerals—								
For the public	384	1,967	1,583	.....	857	4,142	3,285	.....
For railway construction ...	380	.....	.....	380	871	.....	.....	871
Live stock	.....	.....	.....	.....	.....	.....	.....	.....
Rents, demurrage, &c. ...	.....	.....	.....	.....	443	1,106	658	.....

CALCUTTA AND SOUTH-EASTERN RAILWAY.

Comparative Statement of Traffic for the calendar years 1879 and 1880.

Heads of Traffic.	Passengers.							
	Number.				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
1st class	411	429	18	.....	571	491	.....	80
2nd ,, ...	3,987	4,353	366	.....	1,953	2,085	132	.....
3rd ,, ...	608,989	591,021	.....	17,968	77,478	71,622	.....	5,856
Total ...	613,387	595,803	.....	17,584	80,002	74,198	.....	5,804
Miscellaneous	.....	.....	.....	.....	3,418	2,673	.....	745
	Goods.							
	Weight (in tons).				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
Merchandise for the public ...	29,659	31,442	1,783	.....	32,959	32,830	.....	129
Materials for railway construction ...	.....	.....	.....	.....	.....	.....	.....	.....
Minerals—								
For the public	123	492	369	.....	120	384	264	.....
For railway construction	.....	.....	.....	.....	.....	.....	.....	.....
	No.	No.	No.	No.				
Live stock	149	65	.....	84	143	82	.....	61
Rents, demurrage, &c.	.....	.....	.....	.....	1,210	860	.....	350

NALHATI RAILWAY.

Comparative Statement of Traffic for the calendar years 1879 and 1880.

Heads of traffic.	Passengers.							
	Number.				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
1st class	912	595	.....	317	2,131	1,517	.....	614
2nd ,, ...	6,930	2,623	.....	4,316	5,063	3,381	.....	1,682
3rd ,, ...	149,048	131,872	.....	17,176	48,262	40,598	.....	7,664
Total ...	156,899	135,090	.....	21,809	55,456	45,496	.....	9,960
Miscellaneous	.....	.....	.....	.....	5,705	3,785	.....	1,920
	Goods.							
	Weight (in tons).				Receipts.			
	1879.	1880.	Increase.	Decrease.	1879.	1880.	Increase.	Decrease.
					Rs.	Rs.	Rs.	Rs.
Merchandise for the public ...	13,259	7,217	.....	6,042	26,036	25,126	.....	10,911
Materials for railway construction ...	.....	.....	.....	.....	.....	.....	.....	.....
Minerals—								
For the public	1,639	2,429	790	.....	2,586	3,955	1,369	.....
For railway construction ...	.....	.....	.....	.....	.....	.....	.....	.....
Live stock	.....	.....	.....	.....	.....	.....	.....	.....
Rents, demurrage, &c.	.....	.....	.....	.....	407	333	.....	74

Comparative Statement of Traffic of the Bengal Provincial Railways for the calendar years 1879 and 1880.

Railway.	Miles open.		Passenger Traffic.				Goods Traffic.				Steam Boat.	
			Number.		Receipts.		Weight (in tons).		Receipts.			
	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.
					Rs.	Rs.			Rs.	Rs.	Rs.	Rs.
Northern Bengal	230	230	642,236	705,706	4,00,159	4,72,885	87,838	118,632	6,74,518	8,04,624	1,31,949	1,63,505
Tirhoot	82	82	468,501	475,377	1,95,674	2,05,389	52,204	74,142	1,47,449	2,01,475	74,196	98,144
Patna and Gya	57	57	267,119	519,696	1,65,125	3,28,710	20,809	54,561	49,560	1,37,847	.....	.....
Nalhati	27¼	27¼	156,899	135,090	55,456	45,496	14,898	9,646	28,622	19,080	.....	.....
Calcutta and South-Eastern	28	28	613,387	595,803	80,002	74,198	29,782	31,934	33,079	33,214	.....	.....
Total ...	424¼	424¼	2,148,142	2,431,672	8,96,416	11,26,678	205,531	288,915	9,33,228	11,96,240	2,06,145	2,61,649

	Miscellaneous Receipts, including Telegraph and Sundries.		Total Receipts.				Working Expenses.		Net Profits.		Net Loss.		Staff employed.	
	1879.	1880.	1879.	1880.	Increase.	Decrease.	1879.	1880.	1879.	1880.	1879.	1880.	European and East Indian.	Native.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
Northern Bengal	1,77,635	1,71,787	13,84,261	16,12,801	2,28,540	.....,	12,59,140	9,69,292	1,25,121	6,43,509	.....	.....	79	2,061
Tirhoot	41,416	46,060	4,58,735	5,51,069	92,334	.....	3,50,914	3,10,795	1,07,821	2,40,274	.....	.....	31	851
Patna and Gya	15,825	14,999	2,30,510	4,81,556	2,51,046	.....	1,28,723	2,70,300	1,01,787	2,11,256	.....	.....	19	687
Nalhati	7,702	5,349	91,780	69,925	.....	21,855	62,009	73,653	29,771	.....	.....	3,728	2	190
Calcutta and South-Eastern	21,006	34,686	1,34,087	1,42,098	8,011	.....	89,088	1,01,344	44,999	40,754	.....	.....	4	238
Total ...	26,3,584	2,72,881	22,99,373	28,57,449	5,58,076	.....	18,89,874	17,25,384	4,09,499	11,32,065	.....	3,728	135	4,027

Statement of the Results for the calendar years 1879 and 1880.

Railway.	Gross Receipts.		Working Expenses.		Net Earnings.		Total Capital expended.		Interest on Capital expended at 4½ per cent.		Excess of Interest over Earnings.	
	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Northern Bengal	13,84,261	16,12,801	12,59,140	9,69,292	1,25,121	6,43,509	2,03,70,790	2,09,84,599	8,79,106	9,45,545	7,53,361	3,02,036
Tirhoot	4,58,735	5,51,069	3,50,914	3,10,795	1,07,821	2,40,274	53,38,320	56,13,274	2,37,411	2,50,659	1,29,593	10,385
Patna and Gya	2,30,510	4,81,556	1,28,723	2,70,300	1,01,787	2,11,256	30,70,995	34,99,518	1,10,800	1,71,206	9,013	—40,050
Nalhati	91,780	69,925	62,009	73,653	29,771	—3,728	3,46,299	3,48,732	15,238	10,178	—14,533	13,966
Calcutta and South-Eastern ...	1,34,087	1,42,098	89,088	1,01,344	44,999	40,754	67,39,408	67,23,771	.....	.....	.....	.....
Total ...	22,99,373	28,57,449	18,89,874	17,25,384	4,09,499	11,35,793	3,58,65,812	3,71,69,894	.....	.....	.....	.....

Statement of the Mileage Results for the calendar years 1879 and 1880.

Details.	Northern Bengal Railway.		Tirhoot Railway.		Patna and Gya Railway.		Nalhati Railway.		Calcutta and South-Eastern Railway.	
	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.	1879.	1880.
Train mileage	458,539	524,215	124,696	121,995	42,983	113,116	40,322	39,926	39,890	35,834
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Gross earnings per train mile	3·02	3·08	3·68	4·52	5·36	4·26	2·27	1·75	3·36	3·96
Expenses „ „	2·74	1·85	2·81	2·54	2·99	2·39	1·53	1·84	2·24	2·83
Profits „ „	·28	1·23	·87	1·98	2·37	1·87	·74	— ·09	1·12	1·13
Percentage of expenses to earnings	90·92	60·09	76·49	56·39	55·84	56·13	67·56	105·33	66·44	71·32
„ of profits on *total* capital expended	·61	3·06	2·02	4·28	3·31	6·04	8·59	—1·07	·66	·60
„ on capital expended on open line ...	·66	3·20	2·10	4·49	3·57	6·56	8·59	—1·15	·66	·62

BOMBAY AND CENTRAL INDIA.

At the commencement of the year 1880 the Rajputana Railway was open from Delhi to Raipur,* and was under the control of the Consulting Engineer, Calcutta.

Rajputana Railway

* 325 miles.

The section from Ahmedabad to Pahlanpur† (the Western Rajputana Railway, as it was called) was under the Consulting Engineer, Bombay.

† 82 miles.

The intermediate section between Raipur and Pahlanpur‡ was in process of construction under the direct orders of the Director General of Railways.

‡ 168 miles.

On the 20th October 1880 the line between Raipur§ and Sujat was opened for traffic; and on the 1st November following the Rajputana Railway, the Western Rajputana Railway, and the intermediate section under construction were all made over to the control of the Bombay Government.

§ 24 miles.

On the 1st January 1881 the intermediate link between Sujat and Pahlanpur‖ hitherto under construction was completed and opened for traffic by His Excellency the Governor of Bombay, and the whole line was amalgamated throughout from Delhi to Ahmedabad under the title of the Rajputana Railway. At Ahmedabad the Rajputana line joined the Bombay, Baroda and Central India Railway, and through communication was thus established between Delhi and Bombay.

opened for through traffic on 1st January 1881.

‖ 144 miles.

The Rajputana Railway being on the metre gauge, and the Bombay, Baroda and Central India line being on the 5′ 6″ gauge, transhipment arrangements were made for goods at Sabarmati (4 miles from Ahmedabad) and for passengers at Ahmedabad itself.

Junction with the Bombay, Baroda and Central India line.

The bridges which were unfinished at the first opening of the line were completed by the 1st May 1881.

The traffic is gradually being developed; and considering the advantages offered by this shorter and less expensive route, there is every likelihood of its becoming the principal thoroughfare for all traffic between Bombay and Northern India. Some discussion has arisen on the subject of loss of traffic on the part of the Great Indian Peninsula Railway, due to the opening of this new Rajputana route. Before long, however, the Guaranteed Company will receive a compensating benefit by the opening of the Malwa line, which will offer a third alternative route for through traffic; the distances from Bombay to Delhi being—

Traffic.

	Miles.
By Rajputana route *vid* Ahmedabad and Ajmere ...	889½
By Malwa route *vid* Khandwa and Ajmere ...	1,006½
Old route *vid* Allahabad	1,234

The following extracts from the Administration Report of the Manager of the Rajputana Railway give full information regarding the line:—

Completion of the Western Rajputana Railway.—The works on the Western Rajputana Railway were so far advanced to completion by the end of December 1880, that after inspection by the Consulting Engineer the new Railway was formally opened for traffic from the 1st January 1881 by His Excellency the Right Hon'ble Sir James Fergusson, Bart., K.C.M.G., C.I.E., Governor of Bombay.

It will be convenient to present here a tabular statement of the total mileage of the Rajputana Railway as it now exists, with the date on which each portion was opened :—

Opened for public traffic.	Miles.	Date on which opened for public traffic.
Delhi to Garhi Harsaru ...	25¼	Delhi Rewari Section, with Salt Branch (59 miles), for salt traffic only, on 14th February 1873, and for passenger traffic on 1st July 1873.
Garhi Harsaru Junction to Bandikui Junction	109¾	Rewari to Ulwar (46¼ miles) on 15th September 1874.
Branch from Garhi Harsaru Junction to Farukhnagar	7¼	Ulwar to Bandikui (37½ miles) on 7th December 1874.
Agra Fort Station to East Indian Railway Station	1½	Agra-Bhurtpur Section (33¼ miles) for goods traffic on 11th August 1873, and for passengers on 20th October 1873.
Agra to Bandikui Junction	93½	Bhurtpur to Dausa (78¼ miles) on 20th April 1874.
Bandikui Junction to Phalera Junction ...	90¼	Dausa to Jaipur (38 miles) on 12th October 1874.
Phalera Junction to Ajmere	49¾	Jaipur to Sambhar (38½ miles) on 1st March 1875.
Ajmere to Nasirabad	14¼	Phalera to Ajmere (49¾ miles) on 1st August 1875.
Sambhar Branch	4¼	Ajmere to Nasirabad (14¼ miles) on 14th February 1876.
Japog Extension	4¼	Agra Fort Station to East Indian Railway Station (1½ miles) on 1st January 1876.
Extension Japog Siding...	2	Japog Extension (4 miles) in October 1876.
Extension of the Sambhar Branch to Jaora ...	17	Extension of the Sambhar Branch to Kharia (17 miles) on 20th December 1879.
Deodani Siding	2	Extension of Japog Siding (2 miles) on 20th December 1879.
Kankaroola	1½	Deodani Siding (2 miles).
	422½	
From Ajmere east of Abu and through Pahlanpur to Ahmedabad on the Bombay, Baroda and Central India Railway	304¼	Ajmere to Beawar (32·378 miles) on 15th May 1878. Beawar to Raipur (20·847 miles) on 12th August 1879. Raipur to Sujat (20·587 miles) on 20th November 1880. Sujat to Pahlanpur (148·7 miles) on 1st January 1880.
Grand Total ...	726¾	Pahlanpur to Ahmedabad (82·500 miles) on 15th November 1879.

From this statement it will be seen that the main line from Delhi to Ahmedabad, with the branch line to Agra of 95 miles, have now a length of 674¼ miles; that the Farukhnagar and Sambhar Salt Branches contribute 38¼ miles more, and that the remaining mileage (14¼ miles) is furnished by the short branch from Ajmere to Nasirabad, which will in a few months more be extended to Neemuch, where it will join the Holkar and Sindia-Neemuch State Railways, and so complete the main features of the Central System of State Railways.

The total length of line open on 31st March 1881 is 726¾ miles against a total of 545 miles open on the 31st March 1880.

Capital expenditure.—The total capital expenditure upon the Rajputana and Western Rajputana Railways up to the 31st March 1881 may be put approximately at Rs. 4,95,01,482, or Rs. 68,090 per mile of railway.

During the year 1880-81 the further expenditure on capital account upon the Rajputana Railway has been incurred upon completing the Agra Fort station, upon additional accommodation in the Delhi yard, upon more staff quarters at Delhi, Bandikui, and Ajmere, upon water and improved watering arrangements, on additional culverts and other works to protect the line against floods, upon the construction of the general offices at Ajmere, and of quarters for the European clerks attached to the general offices.

The total capital upon which the interest is calculated is assumed at Rs. 4,21,79,369, being the net "expenditure on final heads" to the end of the year 1879, plus half the net expenditure on final heads during the year 1880.

General results of the working of the Rajputana Railway during 1880.—During the year 1880 there were on the average 553 miles of line open and under working; 1,706,758 train miles were run, earning Rs. 43,73,823 and costing Rs. 30,48,138, or 69·69 per cent., leaving 30·31 per cent. of the earnings as net profits.

The earnings and expenses per train mile have been Rs. 2·56 and Rs. 179 respectively. The return upon the capital expended is 3·28 per cent. per annum.

Of the total earnings, coaching traffic contributed in round numbers 29 per cent., goods traffic 66 per cent., and sundries 4 per cent.

In the same round figures, the maintenance of the line costs 13 per cent. of the total earnings, the Locomotive and Carriage Departments 37 per cent., the Traffic Department 11 per cent., while general administration and sundry expenses cost 9 per cent.

The earnings and expenses for the past five years are shown in the following table :—

Year.	Average miles open for traffic.	Earnings.			Expenses.		
		Gross.	Per mile per annum.	Per mile per week.	Gross.	Per mile per annum.	Per mile per week.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1876	394	23,29,592	5,940	114	15,23,622	3,886	74
1877	396	26,96,687	6,809	130	18,33,367	4,629	89
1878	417	29,72,602	6,942	135	18,42,129	4,303	82
1879	438	35,45,420	8,261	158	23,66,253	5,454	105
1880	553	43,73,823	7,967	153	30,48,138	5,552	107

The cost of maintenance of the way and works has amounted to Rs. 5,06,448, or to Rs. 1,084 per annum for each mile open throughout the year. This figure compares favorably with the cost (Rs. 1,092) per average mile open throughout the year 1879; and this notwithstanding the extensive replacement by 41¼ lbs. steel rails of the 36 lbs. iron rails originally laid on the Delhi to Rewari Section of the line.

A tabular statement is appended showing the cost during the past five years (1876 to 1880) of maintenance under its main heads of supervision, labor, materials, new minor works, and miscellaneous. From this it will be observed that the outlay on the materials during the past year has, apart from the cost of the relaying with steel rails above alluded to, been more moderate than might have been expected, and much below that of the preceding year.

This is not the result of any attempt to starve the road, but of the more careful supervision over the removal of the rails and sleepers, which were in some cases taken out of the road prematurely. But the more extensive renewal of sleepers must soon commence, for the average age of the sleepers on the road east of Ajmere is about 6·10 years.

Similarly, in the Locomotive Department important improvements have been made in the system of workshop accounts. Closer supervision over the consumption of running stores has been made possible by simplified arrangements, and at the same time the general condition of the locomotive stock has been very much improved.

Emulation has been excited among the enginemen by the monthly publication of the results of their working, and *premia* have been awarded to the men who attained the best results throughout the year. But although the foundation has, it is hoped, been laid by these measures for the more economical working of the Locomotive Department in future years, the cost of running each traffic train mile has been higher during the year 1880 than in any previous year. Brief notes by the Locomotive Superintendent explain how the increases under these heads of "Running expenses," "Fuel," and "Maintenance and renewals" are inheritances from past years, and that in the other heads of water and oiling some saving has been effected. It is confidently expected that, except under the head of "Maintenance and renewals," where expenditure must continue heavy throughout 1881, better results may have to be recorded in next year's report.

In the Carriage and Wagon Department, which during the year has been made an independent charge, the report of the Superintendent gives full particulars.

The staff of pay clerks has been increased with the growth of the line; and these pay clerks, though under the general supervision of the paymaster, are now stationed at convenient centres for the payment of the salaries or other bills of the district to which they are attached.

Percentage of traffic expenses on gross earnings.—The earnings from passengers were Rs. 12,86,141 in 1880 against Rs. 9,27,916 in 1879. The following table shows the number of passengers booked at the principal stations on the line:—

RAJPUTANA RAILWAY.

Stations.	1878.		1879.		1880.	
	No.	Rs.	No.	Rs.	No.	Rs.
Agra	80,655	1,15,134	83,871	1,15,918	88,197	1,21,316
Bhurtpur	60,742	42,298	65,768	48,475	74,465	56,927
Bandikui	22,099	13,877	26,529	18,171	29,439	20,249
Jaipur	127,501	1,18,039	141,185	1,36,149	164,010	1,58,823
Dana	21,792	11,506	23,310	13,420	24,854	13,836
Phalera	16,565	7,729	23,012	12,968	24,629	11,382
Kishengarh	26,170	11,467	26,864	11,195	31,893	13,609
Ajmere	189,996	1,14,147	209,238	1,20,030	254,170	1,40,158
Nasirabad	97,266	36,681	101,446	48,281	120,601	37,172
Beawar	27,137	15,901	57,205	35,847	64,717	27,794
Delhi	119,056	85,165	145,337	1,21,833	134,485	1,07,512
Gurgaon	39,800	9,903	37,969	9,841	38,179	9,891
Rewari	65,301	38,733	73,479	44,486	75,195	44,622
Garhi-Harsaru	1,829	493	1,441	389	1,624	425
Ulwar	70,339	37,276	69,493	38,804	80,488	40,181
Total ...	966,248	6,58,649	1,086,147	7,75,807	1,206,946	8,03,897

WESTERN RAJPUTANA RAILWAY.

Coaching.

Stations.	1879. *		1880.	
	No.	Amount.	No.	Amount.
		Rs.		Rs.
Ahmedabad	11,805	6,893	122,144	73,705
Sabarmati	2,270	717	25,484	8,538
Kalol	4,329	1,093	40,714	10,991
Dangarwa	3,019	878	28,860	8,604
Mehsana	6,146	1,836	48,875	15,428
Unjha	3,549	1,057	44,410	15,582
Siddhpur	9,973	3,279	69,809	21,927
Pahlanpur	6,306	3,133	60,006	32,674

* Opened from 15th November 1879.

Provident Institution.—The progress report of the year would be incomplete without mention of the Railway Provident Institution. This Institution was opened in February 1880, and has since become a prosperous concern. By the end of December 1880 there were 486 contributors, and the totals of the voluntary and compulsory contributions amounted to Rs. 31,080-13-3 and Rs. 10,448-3-1 respectively. During the year 1880 a sum of Rs. 4,326 from the funds of the Railway was added to the compulsory contributions.

The following tabulated statements are annexed :—

Statement showing cost of Maintenance under main heads of Supervision, Labor, Materials, New Minor Works, and Miscellaneous.

	1876.	1877.	1878.	1879.	1880.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
SUPERINTENDENCE	1,24,019 9 0	1,25,678 10 2	1,22,088 7 7	98,186 3 4	98,662 12 7
LABOR AND MATERIALS... *Maintenance and renewals of permanent-way—*					
Wages	74,997 13 5	1,01,679 14 2	1,02,513 8 9	1,10,568 8 8	1,34,255 9 1
Materials	39,279 14 2	1,36,246 8 0	78,889 11 9	1,09,259 11 7	1,69,794 7 10
Repairs of bridges, stations, and buildings, &c. ...	34,445 7 7	34,641 15 11	32,155 12 7	33,756 7 6	67,808 2 11
Maintenance by contract—					
Amount paid to contractors	1,30,140 0 0	41,681 0 0	4,925 5 7	10,961 1 6	480 0 0
Materials supplied by the State	18,179 15 11	3,038 10 1	204 9 0	*Nil*	*Nil*
NEW MINOR WORKS	858 5 2	12,645 1 8	20,288 4 10	35,544 2 8	10,969 2 7
MISCELLANEOUS EXPENDITURE	6,589 13 6	10,341 14 0	8,925 1 0	15,884 0 10	21,667 7 9

RAJPUTANA RAILWAY.

Capital Finance Account, 1880-81.

Main heads of expenditure.	Official year, 1880-81. Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.	Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
Capital Productive Public Works.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Preliminary Expenses ...	...	39,700	39,686	...	39,686	5,90,202	6,29,888	6,29,902
Land	10,000	15,800	11,257	...	11,257	5,66,116	5,77,373	5,87,192
Construction of line ...	81,259	6,09,000	6,51,389	...	5,51,339	64,33,295	70,84,634	72,62,295
Ballast and Permanent-way	51,489	3,94,200	4,25,821	...	4,42,582	1,06,37,710	1,10,63,531	1,11,25,910
Stations and Buildings ...	5,26,552	3,82,400	4,30,842	...	4,30,842	47,46,548	51,77,390	60,87,948
Total Construction Accounts	6,69,300	14,41,100	15,58,945	...	15,58,945	2,29,73,871	2,45,32,816	2,56,93,247
Plant	...	30,600	41,703	...	41,703	6,39,730	6,81,433	9,20,330
Rolling Stock ...	10,00,000	16,91,400	9,76,113	...	9,76,113	54,91,073	64,67,186	89,52,973
Establishment ...	30,700	47,400	56,337	...	56,337	20,37,289	20,93,626	20,99,689
Total Expenditure on Final Heads ...	17,00,000	32,10,500	26,33,098	...	26,33,098	3,11,41,963	3,37,75,061	3,76,66,239
Suspense Accounts ...	...	36,500	38,700	...	38,700	19,40,781	19,79,481	...
Grand Total expenditure	17,00,000	32,47,000	26,71,798	...	26,71,798	3,30,82,744	3,57,54,542	...
Ordinary.								
Preliminary Expenses ...	...	...	6	...	6	326	332	326
Land	...	...	...	...	...	...	...	...
Construction of line ...	6,858	28,600	32,226	...	32,226	2,31,579	2,63,805	2,60,179
Ballast and Permanent-way	11,966	43,000	26,567	...	26,567	4,69,759	4,96,326	5,12,760
Stations and Buildings ...	1,176	49,400	40,677	...	40,677	22,437	63,114	71,837
Total Construction Accounts	20,000	1,21,000	99,476	...	99,476	7,24,101	8,23,577	8,45,102
Plant	...	2,000	723	...	723	1,856	2,579	3,856
Rolling Stock ...	...	...	...	...	...	...	...	...
Establishment ...	...	2,000	1,379	...	1,379	11,953	13,332	13,952
Net Indian Outlay ...	20,000	1,25,000	1,01,578	...	1,01,578	7,37,910	8,39,488	8,62,910

Distribution of Outlay by Funds to which chargeable.

	Productive Public Works Outlay.		Ordinary Outlay.		Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.	
	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	26,71,798	.....	1,01,578	.....	27,73,376
To close of the year	3,56,54,539	.....	9,39,491	.....	3,65,94,030

Engineering Department.—The Western Rajputana Railway was completed during the year. The section Raipur to Sujat was opened on 20th October 1880, and Sujat to Chitrasni on 1st January 1881. The whole line from Delhi and Agra to Ahmedabad is, therefore, now open for traffic.

The Deodani and Kankar-Oola sidings at Sambhar have also been completed and opened.

The total length of the line on the 31st March 1881 is 726¾ miles against 463 miles on the same date of the previous year.

Engineering charges.—Towards the end of the year 1880 changes were made in the Executive Engineer's charges on the open line. The section Bandikui to Kanota was added to the Agra Division, the head-quarters of which was moved from Agra to the changing

station of Bandikui. In consequence of the heavy work in progress or expected at Ajmere, the Ajmere Division was further relieved of the section Ajmere to Raipur, which, with the recently opened section Raipur to Sujat, was placed under the Executive Engineer of the Sendra Division. The original charges on the line opened on the 1st of January 1881 were maintained. Much work was still in progress, and it was not yet convenient to break up the construction divisions.

Maintenance.—The road and works have been kept in thoroughly efficient order during the year. The total cost of maintenance, excluding general superintendence, has been Rs. 3,45,743, or Rs. 53-10-8 per mile of track, including sidings, per month, against Rs. 3,40,430, or Rs. 58 per mile per month, for the previous year. These figures do not include Rs. 1,25,017 expended in relaying the section of the line Delhi to Rewari, or take credit for Rs. 73,845, value of material renewed since the opening of the line and returned to store during 1880; nor do they include expenditure under Abstract A—6th, New minor works, which shows a decrease of nearly Rs. 25,000. This cannot be taken as a saving on maintenance.

The item upon which the saving has been effected is permanent-way material. During 1880, 1,647 rails and 8,405 sleepers were renewed against 2,212 rails and 26,470 sleepers during the previous year. The saving in rails and part of the saving in sleepers have been effected by more careful maintenance and greater expenditure on labor, but is also due to some extent to the improved state of the rolling stock. The decrease in sleeper renewals has also been caused by increased care in checking the removal of material whose life had not quite expired.

Delhi station.—Seven blocks of quarters for guards and drivers and ten menials' quarters have been constructed, an additional engine pit has been added to the locomotive yard, and the narrow gauge has been carried into the East Indian Railway yard, where passengers are now landed for transhipment upon the broad gauge platform.

Rewari.—A large reservoir for rain water has been completed, and its effect upon the neighbouring locomotive well has been very satisfactory.

Bandikui.—The locomotive arrangements have been extended, the water-supply much improved, the traffic yard is being remodelled to increase the power of transhipment of passengers and of remarshalling of trains, and thirteen blocks of European staff quarters are in progress. A system of roads and drainage has been carried out to the great improvement of the cantonment, and a cemetery has been fenced in and planted.

Jaipur.—The new siding and carriage shed have been completed, and sundry improvements to the station building and platform have been effected.

Phalera.—An entirely new locomotive yard and shed have been nearly completed, and a satisfactory arrangement for a plentiful supply of good water has been made.

Ajmere.—An additional unit has been added to the station building for the Telegraph Department, the accommodation for locomotives has been increased, and a large new erecting shop has been commenced. The extension of the carriage shop has been roofed in, the locomotive offices have been completed, ten blocks of quarters for general office clerks and eleven sets for guards and drivers have been constructed. The foundations of the general office building have been completed, and the walls of the plinth are in progress.

Agra.—The Fort station has been completed, and the rooms for the Postal Department are nearly ready for occupation.

General.—The new culverts between Delhi and Bandikui and between Kishengarh and Ajmere were completed before the rains of 1880, and no damage was done by floods, although considerable local falls of rain, especially between Ulwar and Bandikui, occurred. The river Sabi, as usual, caused some uneasiness, and it was found necessary to throw up a temporary bund to keep the river in its proper channel. It is proposed to raise the bank at the point threatened, which would have been topped and breached this year had the temporary bund burst.

Second water columns have been fixed at Gurgaon, Ulwar, Arno, Basi, Sanganir, Dhankia, Phalera, Naraina, and Ladpura stations to supply the passenger train engines while these trains are standing at the platforms.

The works on the Western Rajputana Railway came under the management of the Open Line, and, except the Sirohi Division, under the Engineering Department on the 1st January 1881. The chief works then incomplete were the Luni, Someri, Jowali, Rani, Mittri, and Karibali bridges. Of these, all, except the Luni, were finished on the 31st March. On the 2nd of March the Sirohi Division with the Chandawal, Mawal, and Bolaram bridges unfinished were taken over, and on the 31st March the Chandawal and Mawal were completed and ready for testing.

The Bolaram and Luni will be finished on the 1st of May 1881.

Locomotive Department.—During the past official year the locomotive stock and tools and plant belonging to this Department have been maintained in good working order.

The locomotive stock on the Rajputana Railway on the 31st March 1881 was as shown in the subjoined statement:—

Class of engines ...	A		B		C	D	E			F				M		
Particulars.	Dübs & Co.	R. W. Hawthorn.	Dübs & Co.	Nasmyth, Wilson & Co.	Nasmyth, Wilson & Co.	Sharp, Stewart & Co.	Sharp, Stewart & Co.	Neilson & Co. (modified).	Vulcan Foundry.	Dübs & Co.	Dübs & Co.	Yorkshire Engine Company.	Neilson & Co.	Dübs & Co.	Black, Hawthorn & Co.	Total number of engines on line.
Total stock on line on 1st April 1880 ...	18	...	14	12	12	1	9	17	10	10	15	6	9	...	1	134
Additional during the year...	...	5	...	...	...	...	...	...	8	12	6	...	13	20	...	64
Actual stock on line on 31st March 1881 ...	18	5	14	12	12	1	9	17	18	22	21	6	22	20	1	198

The following table is a comparative statement of the Locomotive Department working expenses during the last six calendar years from 1875 to 1880, both inclusive:—

	1875.	1876.	1877.	1878.	1879.	1880.
Traffic train miles ...	517,775	728,846	828,012	995,630	171,971	1,354,623
Train miles ...	553,659	762,835	892,404	1,038,318	1,529,073	1,433,404
Vehicle „ ...	12,283,153	16,118,866	19,859,961	21,592,420	23,466,356	Unknown.
Total Locomotive Expenses, Rs. ...	4,03,700·5	5,32,364·68	7,03,377·95	7,51,459·34	10,88,145·16	12,04,309·04

	1875.		1876.		1877.		1878.		1879.		1880.	
	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.
	As.	As.	As.	As.	As.	As.	As.	As.	As.	As	As.	As.
(1) Running expenses	3·03	2·83	3·23	3·06	3·65	3·39	3·18	3·05	2·80	2·70	3·19	3 02
(2) Fuel ...	6·13	5·74	5·24	4·95	5·73	5·32	5·09	4·88	5·02	4·83	5·98	5·66
(3) Water ...	3·08	·29	·28	·26	·21	·201	·205	·19	·17	·16	·26	·24
(4) Oiling, &c. ...	·59	·56	·50	·47	·56	·52	·52	·50	·63	·61	·45	·43
(5) Maintenance and renewals ...	1·33	1·26	1·47	1·39	2·09	1·94	1·78	1·71	2·04	1·97	2·98	2·82
Total Locomotive Expenses ...	12·86	11·66	11·81	11·16	13·59	12·61	12·07	11·57	11·82	11·38	14·22	13·44

(1) Increase due to surplus running staff from 1879, which it was supposed to be desirable to keep for the opening of the line through.
(2) Increase due to deficiency of coal found at stock verification, which should have been charged off in 1879; only adjusted in 1880.
(3) Many watermen and bullocks were put on in the beginning of 1880, who were discharged again in course of the year when traffic decreased.
(4) Decrease due to the exercise of more economy by the running staff, whose attention was drawn to waste of oil in force on the line.
(5) Increase due to heavy boiler repairs on account of bad water and which could not be carried out before for want of shops.

N.B.—In the above statement the coal per traffic train mile is shown at 14·22 annas, and per train mile (which includes maintenance mileage) at 13·44 annas; but to arrive at the cost per engine mile the miscellaneous service mileage should be added, 194,300 miles, which gives a total of only 11·83 annas per engine mile.

During 1880 the engines of the same tender and capacity have been placed, as far as possible, in one locomotive station, which facilitates keeping the engines in repairs, and allows many watering stations to be closed in the districts where engines with large tenders worked. Stations with bad water have been closed as far as possible, and the complaints of leaky tubes have diminished.

In order to stop the corrosion on the smoke box tube-plates, several copper smoke box tube-plates have been put in for a trial. The engines have not yet been put into running. A report will follow. In engines with round fire-box tops the practice has been continued of taking out the heavy crowbars and substituting stays with the mid-feather, which can be kept easier clean. No complaint has come in so far.

During February and March 1881, 20 new M class engines for mail service have been received. The engines work well so far ; but owing to the inside cylinders, the gear is much cramped ; and I should prefer the same style of engines with outside cylinders, and, as far as possible, with old F class fittings, in order to reduce the number of duplicates required.

Verification of rolling stock.—In the month of June 1880, permission was accorded to a complete verification of the stock on the line. The verifiers completed the work on the Rajputana Section on the 4th November 1880. They then commenced the Western Rajputana Section, and completed their work before the two sections were coupled up on the 1st of January.

The result was on the whole fairly satisfactory, considering that no proper verification had been made since the opening of the line.

Duty mileage.—The train mileage is as follows :—

Traffic train mileage	...	...	...	1,354,623
Train mileage	...	...	...	1,433,404

The gross Revenue expenditure for the year ending December 31st, 1880, including all current office and establishment expenses, oiling, fair wear and tear repairs, rebuilding, and damage sustained in accident, was Rs. 1,39,611-12-4.

The cost of duty was as follows—

Per traffic train mile	...	...	Rs. ·103 × 16 = 1·648 annas,
„ train mile	...	...	„ ·096 × 16 = 1·536 „

against 1·995 annas and 1·92 annas respectively for the corresponding period of the previous year.

The cost of damages due to accidents amounted to Rs. 19,742-9-11. The net Revenue expenditure within the control of the Carriage and Wagon Department was therefore Rs. 1,39,611-12-4 — Rs. 19,742-9-11 = Rs. 1,19,839-2-5, and the net cost of duty would be—

Per traffic train mile	...	Rs. ·8848 × 16 = 1·4156 annas.
„ train mile	...	„ ·8362 × 16 = 1·3377 „

The figures in the subjoined table show the *gross* cost of duty compared with preceding years :—

Particulars.	1875.		1876.		1877.		1878.		1879.		1880.	
Traffic train miles	517,775		720,846		828,012		995,630		1,472,971		1,354,623	
Train miles	553,659		762,835		892,404		1,038,318		1,529,073		1,433,404	
	1,071,434		1,483,681		1,720,416		2,033,948		3,002,044		2,788,027	
Expenses, Carriage and Wagon...	Rs. 29,735·24		Rs. 1,02,587·73		Rs. 1,45,092·91		Rs. 1,38,970·00		Rs. 1,83,753·74		Rs. 1,39,611·76	
	1875.		1876.		1877.		1878.		1879.		1880.	
Expenses per traffic train and train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.	Per traffic train mile.	Per train mile.
CARRIAGE AND WAGON.	a	a	a	a	a	a	a	a	a	a	a	a
Repairs to carriages ...	·23	·21	·70	·99	1·275	1·18	·97	·93	·88	·80	·56	·53
Repairs to wagons ...	·33	·31	·77	·73	·315	·75	·45	·43	·48	·46	·49	·46
Oiling (labor and stores) ...	·24	22	·475	·45	·305	·28	·23	·22	1·25	·11	·23	·21
Total Carriage and Wagon Expenses.	·918	·859	2·27	2·15	2·805	2·60	2·23	2·14	1·995	1·92	1·64	1·55

Condition of stock at commencement of year.—The working details of the stock were in fair order, but vehicles were generally neglected in point of cleanliness. The cleaning staff is now placed directly under the out-station examining staff. Careless men have been punished or discharged, and considerable improvement has resulted.

The quantity of lime, salt, and sulphates in the water at our principal cleaning stations produce perceptible deposits on the surfaces of the vehicles on evaporation after washing which

destroy the varnish in a very short time. The use of canal water at Delhi, of Anasagar water at Ajmere, and of the river water at Ahmedabad is the remedy for this, if it can be made available in the small quantities we require.

Punjab Northern stock.—The stock transferred from this line has taken some trouble and expense to set up; but it is gradually being thoroughly overhauled.

Trimmings.—Much of the original stock requires entire new trimmings, and is withdrawn from traffic as often as it can be spared. The roan skins do not wear well: they lose their color and become rotten very soon. I would strongly urge the early substitution of the American Morocco dressed hides reported in this office No. 641 of 4th March 1881.

Vehicles withdrawn for heavy and slight repairs.—On an average 9·21 per cent. of the stock passes through the Central shops monthly We may look for a considerable increase in this number during the current year on account of the additional stock coming under our charge from the Southern Section, Western Rajputana Railway.

Labor and appliances.—The average number of workmen of all kinds employed in the Carriage and Wagon Department of the Central shops was 528. The average amount paid for labor of all kinds per mensem was Rs. 6,078. The average earnings per man would therefore be Rs. 11·5; this includes overtime and piece-work. We are compelled, by present peculiar conditions of working, to utilise the smithy, foundry, and machine shops of the Locomotive Department; and as it would be inconvenient that the foremen and men of the Locomotive Department should also receive direct orders from the Carriage and Wagon Superintendent, the Locomotive Superintendent retains complete command of the men and of expenditure incurred on work executed for this Department. The Carriage and Wagon Department furnishes all necessary drawings, &c. Inconvenience is sometimes felt by both Departments, but matters are so arranged that this is reduced to a minimum. Our labor pay sheets do not, therefore, include the value of the labor or the actual number of men employed on work for the Carriage Department. The average value of labor transferred from the Locomotive Department is Rs. 1,378, representing about 120 additional men.

Piece-work.—Piece-work is now established on a system that gives satisfaction to the majority of the men. Every workman engaged in a contract job participates in the profits and losses on that job, and thus has an incentive to work to the utmost of his ability, or to reprove a lazy companion. The leading hands are the minority who would like to secure all the profits, each of whom would, in case of a heavy loss, probably decamp, thus depriving us of a good workman, and in all probability a good gang of men. All things considered, the work is done well and at fair rates. We know the exact net cost of work so executed, and are accumulating a mass of useful data for application in future operations. Our present object is to secure a good standard of excellence at reasonable rates, and to secure as much for our money as local circumstances will permit. When local circumstances improve to the extent of inducing men to fairly settle down comfortably with their families, an adjustment of rates will be possible without fear of scaring labor away.

Source of labor-supply.—We are principally dependent upon the North-Western Provinces for our labor. Bombay workmen do not find our rates of wages tempting enough to induce them to engage with us. The question of settling the workmen in comfortable homes at moderate rents well deserves the serious attention of the Government. The accruing advantages of a plentiful supply of cheap labor warrant my inviting serious attention to this vital point.

New rolling stock.—The attached list shows the new rolling stock turned out of the Ajmere shops during the financial year :—

Description of vehicles.	Total number of vehicles turned out.
Coaching.	
2nd class carriages	10
3rd „ „	9
Brake-vans	30
Carriage trucks	3
Post Office vans	6
Total ...	58
Goods.	
Covered goods wagons	31
14′ iron covered goods wagons	150
15′ 6″ „ „ „ military type	50
14′ iron low-sided „ „	25
15′ 6″ iron platform „	25
14′ „ timber trucks	3
Total ...	284

Traffic Department.—The gross earnings for the last six half-years have been as follows:—

	Rs.
1st half of 1878	16,53,046
2nd „ 1878	13,18,656
1st „ 1879	21,72,257
2nd „ 1879	13,73,161
1st „ 1880	21,64,763
2nd „ 1880	15,58,956

The falling off in the first half of 1880 is almost wholly in the goods traffic. As the ton mileage was slightly greater than in the corresponding half of the previous year, the average rate of freight must have been somewhat less.

The large falling off in weight of grain, seeds, and cotton was only just compensated by the increased tonnage of salt.

Passenger traffic.—The passenger traffic of the past six half-years has been—

	No.	Earnings. Rs.
1st half of 1878	653,507	... 3,72,810
2nd „ 1878	666,601	... 3,80,210
1st „ 1879	802,775	... 5,10,136
2nd „ 1879	672,440	... 3,73,722
1st „ 1880	1,074,921	... 5,12,783
2nd „ 1880	969,911	... 4,79,821

The average mileage travelled by 3rd class passengers was—

	Miles.
1878	52·68
1879	51·29
1880	44·91

The average contents of the 3rd class carriages were—

	No.
1878	13·26
1879	13·39
1880	15·66

The number of passengers in the year increased therefore from 14¾ lakhs to 20¼ lakhs, and the coaching earnings from Rs. 8,84,000 to Rs. 9,92,600; the increase in receipts being out of proportion to the increase in numbers carried, because of the shortness of the average distance travelled.

The falling off of the average distance travelled may have been partly due to the newly-opened line bringing to the line only short-distance passengers.

Goods traffic.—The goods traffic of the past six half-years was—

	Weight in tons.	Earnings. Rs.
1st half of 1878	150,676	... 11,88,551
2nd „ 1878	107,064	... 8,65,637
1st „ 1879	165,417	... 15,72,844
2nd „ 1879	119,252	... 9,70,733
1st „ 1880	175,231	... 15,62,198
2nd „ 1880	122,888	... 10,06,917

The average mileage of goods has been—

	Miles.
1878	133·32
1st half of 1879	159·94
2nd „ 1879	129·25
1st „ 1880	155·59
2nd „ 1880	143·40

The average contents of goods vehicles have been—

	Tons.
1st half of 1878	2·82
2nd „ 1878	3·10
1st „ 1879	3·23
2nd „ 1879	2·27
1st „ 1880	2·66
2nd „ 1880	2·73

I have already pointed to the falling off in the goods receipts in the first half of 1880 as the cause of the falling off in the total receipts.

The decrease in the average load is explained by the train mileage and vehicle mileage figures, which follow.

The total traffic train mileage in the three years was—

	Miles.
1st half of 1878	517,396
2nd „ 1878	478,234
1st „ 1879	769,191
2nd „ 1879	702,780
1st „ 1880	823,592
2nd „ 1880	531,031

The average receipts per train mile were—

	Rs.
1st half of 1878	3·1964
2nd „ 1878	2·758
1st „ 1879	2·824
2nd „ 1879	1·95
1st „ 1880	2·63
2nd „ 1880	2·94

The average number of vehicles on trains was—

	No.
1878	21·25
1879	17·73
1880	19·61

In such comparison as is made between the working of successive years, it is right to leave out of account the excessive train mileage and the insignificant train earnings of the second half of 1879, as these variations are connected with the unfortunate experiment made in that half-year, in the belief that the carrying capacity of the line would be improved by accelerating the pace of all trains.

It is due to the experiment in question that the total train mileage of 1880 is less than that of 1879.

The first half years between which alone a comparison is possible (the views temporarily followed as to speed and loads of trains being abandoned again at the end of 1879) show a very great increase in train mileage, with a corresponding decrease in the receipts per train mile.

The reason appears in the following figures of the goods vehicle mileage during the six half-years :—

	Loaded.	Empty.
	Miles.	Miles.
1st half of 1878	5,610,972	1,953,158
2nd „ 1878	4,350,596	1,160,294
1st „ 1879	6,995,732	1,544,704
2nd „ 1879	5,432,606	2,251,634
1st „ 1880	7,503,134	2,968,989
2nd „ 1880	5,037,725	2,086,543

In these figures it is seen that, while in the six months ending June 1879 the proportion of empty to loaded vehicle mileage was not much over 1 to 5, in the corresponding half of 1880 the proportion was about 2 to 5.

Light is thrown upon the increase of empty mileage by the following table of increases and decreases of weight of chief commodities carried in 1880 as compared with 1879 :—

	Increase.	Decrease.
	Mds.	Mds.
Cotton	.....	41,051
Ghee and oil	5,905	.....
Grain and pulses	.....	4,43,653
Gunny	14,279	.....
Piece-goods	13,102	.....
Salt	5,08,077	.....
Seeds	.....	21,087
Sugar	.....	5,719

We have been chiefly dependent on the up traffic in grain, pulses, sugar, piece-goods, and gunny to balance the down traffic in salt and cotton. The down traffic improved while the up traffic fell off.

Here may be briefly noticed the increases and decreases of goods carried in detail :—

Exported *seeds* and *cotton* both fell off, owing to deficiency of crop, and *grains* and *pulses*, owing to a more equal harvest.

Piece-goods improved with the harvest and with the extension of railway communication.

The greater quantity of *gunny* was for the greater quantity of salt.

The year's increase of *salt* was chiefly from the Sambhar lake. While the produce from the Farukhnagar source rose from 5,28,000 maunds to over 6,00,000, the product of the lake rose from 27,00,000 to over 32,00,000.

There was a difference of 5 lakhs between 1878 and 1879 also; but to continue the rate of the last two years' increase, an improvement of 10 lakhs is necessary in the next eight months, as there has been a falling off of 5 lakhs in the first quarter of 1881. Going back to the beginning of the financial year only, I find that —

the *cotton* traffic was greatest in April and December;
the traffic in *grain* and *pulses* in April, May, and December;
the traffic in *salt* in May, June, July, October, November, and December;
the traffic in *seeds* and *sugar* was relatively insignificant after June.

The traffic expenses for the six half-years were—

	Rs.
1st half of 1878	1,36,401
2nd ,, 1878	1,42,645
1st ,, 1879	1,63,633
2nd ,, 1879	1,73,948
1st ,, 1880	1,84,581
2nd ,, 1880	1,65,535

The traffic expenses per train mile work out as follows—

	Annas.
1st half of 1878	4·22
2nd ,, 1878	4·77
1st ,, 1879	3·40
2nd ,, 1879	3·96
1st ,, 1880	3·59
2nd ,, 1880	4·98

The gross earnings increased by 5 per cent.; the traffic expenses by about 4 per cent. The cost is throughout greater in second half-years; and taking all circumstances into consideration, the cost in the second half of 1880 does not compare unfavorably with that in the second half of 1878. Any comparison with the second half of 1879 is vitiated by the experiment in light trains, to which I have already referred.

I proceed to notice in detail the variations in traffic expenses :—

(*a*) The increase of Rs. 7,893 under the head of station staff is due partly to the opening of new stations and partly to the engagement of men in anticipation of requirements for that portion of the Western Rajputana State Railway which was to be opened on the 1st January 1881.

(*b*) The increase of Rs. 2,727 on account of train staff is due to the same cause, and to the payment of higher wages.

(*c*) The increase of Rs. 4,921 for clothing is due partly to increase of staff and partly to allocation of amounts held in suspense from previous year.

The chief decreases in expenditure are—

(*d*) Rs. 1,378 in travelling allowances, due to reduction of allowances.

(*e*) Rs. 18,254 for wagon covers, ropes, &c., the supply remaining over from the previous year being large.

(*f*) Rs. 12,485 for fittings and, furniture, due to return of stores not required and a smaller issue than in the previous year of lamps of all kinds, safes, stools, &c.

(*g*) Rs. 4,230 for miscellaneous expenses, chiefly due to wrong allocation in the previous year.

The chief event of the year was that with which it closed—the opening of the line from Sujat to Pahlanpur and the absorption of the Western Rajputana Railway from Pahlanpur to Ahmedabad.

A short extension of 22 miles had been opened from Raipur to Sujat on the 1st November.

Short extensions were also opened in August on the Sambhar Branch to Deodani and on the Jajog siding.

No alteration of rates of sufficient importance to appreciably affect the gross earnings of the line was introduced in the year 1880.

The total amount paid in settlement of claims for compensation during the year was Rs. 683-8-9.

This is made up as follows :—

	Rs.	A.	P.
Robberies at stations	288	0	0
Lost and stolen in transit	193	8	0
Fires	107	4	9
Damaged goods	65	0	0
Exchanged goods	66	3	9
Other cases	75	9	9
Total	795	10	3

which is reduced to Rs. 683-8-9 by deductions, amounting to Rs. 112-1-6, from the salaries of men whose carelessness has contributed to loss of goods.

The compensation bill of the year compares unfavorably with that of 1879; but in this latter year we were, I consider, exceptionally fortunate. The frequency of robberies at Raipur in the early part of 1880 was noticed in the last Administration Report.

Police Department.—The previous report having been prepared for the calendar year 1879, the present report embraces a period of fifteen months, *viz.*, from 1st January 1880 to 31st March 1881.

Extension of line and new police stations.—Since furnishing the last report, the entire line has been completed and through communication established with Bombay. The jurisdiction of the Police Superintendent, Jaipur, however, extends up to and including Abu Road station, or 611¾ miles, *plus* the Sindia Railway mileage, *viz.*, 69¾ miles.

The force on the 31st March 1881 consisted of—

Inspectors	2
Sub-Inspectors	8
Head Constables	34
Constables	231
European Sergeants	2
Total ...	277

In the above figures the following are included for the Sindia Railway :—

Head Constables	3
Constables	20
Total ...	23

During the period under review the chowkidari system was abolished.

House accommodation.—Permanent quarters for the police have yet to be provided at Agra Fort, and on the extension between Beawar and Abu Road, and more especially at Ajmere.

The transfer of the head-quarters of the Police Superintendent from Jaipur to Ajmere is a question that calls for early consideration in view of the approaching amalgamation of the Rajputana and Malwa systems.

Crimes reported, investigated, and punished.—Five cases were under trial at the end of 1879, 254 persons were arrested during the period under review,—making a total of 259 cases. Of these, 229 were convicted, 24 discharged, 4 transferred, and 2 escaped. The number of cases of crime investigated was 372. Out of these—

71 were under the Railway Act;
4 were under the Police Act;
5 under section 94, Act X of 1872. The remainder
292 under the Indian Penal Code.

There were 233 cases of theft, 4 of dacoity, 1 of criminal breach of trust, and 9 of dishonestly receiving stolen property. The value of property stolen was Rs. 8,791-13-3, of which Rs. 1,095-7-6 were recovered.

The amount of Railway property stolen of which the value has been ascertained was Rs. 2,046-10-0, and the value recovered Rs. 384-14-0. The total number of these cases was 69, and in 33 of these the property was directly under the control of the police. The value of the property lost under the latter circumstances was Rs. 1,297-0-9, and the value recovered Rs. 222. The number of persons arrested for these crimes was 39; of these, 37 were convicted and 2 discharged.

There was a marked decrease in the number of thefts of Railway property in the custody of the Police during the last nine months of the year, which is attributed to the duties of watch and ward being performed by police constables, instead of, as before, by chowkidars.

The number of cases of crime in which Railway servants were implicated was 69. Of these, 52 were convicted and 17 discharged or acquitted. Of this number, 47 were prosecuted, 31 convicted, and 16 discharged or acquitted for offences under the Penal Code, and 22 were prosecuted, 21 convicted, and 1 discharged for offences under the Railway Act.

Store Department.—The following statement exhibits the average monthly cost of the establishment for the past five years, and the cost per mile:—

	1876.	1877.	1878.	1879.			1880.		
				Raj.	W. Raj.	Total.	Raj.	W. Raj.	Total.
	Rs.	Rs.	Rs.	Rs.	* Rs.	Rs.	Rs.	Rs.	Rs.
Cost of establishment for the whole year.	13,390	16,322	14,649	18,640	137	18,777	19,313	5,976	25,289
Average monthly cost ...	1,116	1,360	1,220	1,553	11	1,564	1,609	498	2,107
Mean mileage open ...	392	396	428	434	10	444	467	82	549
Cost per mile per year ...	34·15	41·21	34·22	42·95	13·70	42·29	41·35	72·87	46·06
Ditto per month ...	2·84	3·43	2·85	3·58	1·14	3·52	3·44	6·07	3·83

* For 1½ months only.

Malwa Railway.

The Holkar, Sindia-Neemuch, and the Neemuch-Nasirabad Sections of the Malwa-Rajputana Railway System are so essentially parts of one undertaking, that, although part of the system is open line and part line under construction, it has been thought more convenient to deal with these sections together in the preceding chapter.

The following additional details of the working of the open line from Khandwa to Chittor are of interest:—

Average mileage open.—The total average railway mileage open for public traffic throughout the year 1880 was 227 miles, against 171 miles during the last year.

Earnings and expenditure.—The total earnings during the year 1880 amount to Rs. 14,01,259, and the expenditure to Rs. 10,47,269, against Rs. 11,45,838 and Rs. 8,54,010 respectively of the previous year, showing net earnings of Rs. 3,53,991 during 1880 against Rs. 2,91,828 during 1879.

The total train mileage run during the year was 511,718 against 427,384 of the preceding year, the cost per train mile being Rs. 2·05 during 1880 against Rs. 2·00 during 1879. The gross earnings per train mile were Rs. 2·74 and 2·68 during the present and the past years respectively, resulting in a profit of Re. 0·69 per train mile during 1880 against Re. 0·68 during 1879.

The percentage of the total outlay in the various departments and the percentage of expenditure to earnings during the years 1880 and 1879 compare as follows:—

	1880.	1879.
Percentage of the total Revenue outlay.	Rs.	Rs.
Maintenance	26·04	20·22
Locomotive and Carriage and Wagon Departments	47·69	50·35
Traffic Department	16·05	16·75
General and Miscellaneous	10·22	12·68
Total ...	100·00	100·00
Percentage of Revenue expenditure to earnings.		
Maintenance	19·46	15·07
Locomotive and Carriage and Wagon Departments	35·64	37·53
Traffic Department	12·00	12·48
General and Miscellaneous	7·64	9·45
Total ...	74·74	74·53

The percentage of profits during 1880 on the total capital expenditure is Rs. 1·22, and on the capital cost of open line Rs. 1·40, against Rs. 1·16 and Rs. 1·46 respectively during he year 1879.

ENGINEERING DEPARTMENT.

Holkar Division (Khandwa to Indore, 86 miles).

Transfer goods yard, Khandwa.—Since the last report, the Great Indian Peninsula Railway Company have put in hand the erection of the transfer goods shed and sidings at Khandwa. The Holkar Railway sidings having remained unused during the past twelve months, require a considerable amount of packing and lifting, especially the long bank leading to the transfer yard from the present Khandwa station. It is not known by what date the Great Indian Peninsula Railway Company intend completing their work. Until then it will not be possible to derive any benefit from the capital already sunk in the Holkar Railway works.

Khandwa workshops.—During the year under report considerable alterations have been made in the general arrangements of the Khandwa workshops. The machine shop has been completed, the yard has been enclosed by a wall and pale fencing with necessary gates, thus enabling a proper supervision to be exercised over the workmen coming in and going out, which was not possible before.

The new engine-erecting shop has been put in hand, and is being pushed on. Some delay was occasioned on account of the non-arrival of the roofing from Ahmednagar and the alterations necessary in the design to meet the requirements of this roof, it having been originally intended to put up a rail roof similar in design to that used for the other buildings.

Weighbridge and loop line, Mhow.—Great inconvenience has long been felt at Mhow owing to the very limited means provided for weighing large quantities of goods, more especially on the arrival or departure of troops, when great delay was occasioned by the baggage having to be weighed piecemeal. To obviate this, the erection of a weighbridge with the necessary loop line and hut was sanctioned, and is very nearly ready for use.

Carriage examination pit, Mhow.—Owing to the metre gauge vehicles being so near to the ground, great difficulty is found in properly examining them, as is done with rolling stock of a broader gauge. To meet this difficulty, a carriage examining pit was sanctioned for Mhow, and is now about three-fourths finished. It is of sufficient length to accommodate a train, and has been made on the platform line, so that on the arrival of a train it will be possible at once for the carriage examiners to proceed along the whole length and see that all the carriages or wagons are in good running order.

Large bridges.—The re-timbering of the large bridges, *viz.*, Loodhya, ravine No. 2, and bridge 353, has been finished. There yet remain Choral No. 1 and Choral No. 2, which will be taken in hand in 1881-82.

Maintenance of the line.—The road has been kept in good running order. The percentage of renewal of rails during the year has been 1·02, and of ordinary renewals of sleepers 2·78; but this does not give a true idea of their condition, as the extraordinary renewals foreshadowed in the previous report are just now being carried out, which will bring up the average to about 36 per cent.

Indore Division (Indore to Ujjain and Chittor, 203 miles).

Additional length opened during the year.—The Indore division has been extended considerably during the past year by the opening for traffic of the Neemuch and part of Neemuch-Nasirabad Railway by sections,—the first of 20¾ miles, Rutlam to Jaora, on 26th February 1880; the second of 31½ miles, Jaora to Mandsaur temporary station, on 8th April 1880; the third of 30½ miles, from Mandsaur to Neemuch, on 2nd July 1880; and the fourth of 34 miles, from Neemuch to Chittor, on 10th March 1881 the last section being part of the Neemuch-Nasirabad Railway.

Capital Works.—The section from Rutlam to Mandsaur was in a very incomplete and unfinished state when opened for traffic, one station building only (the present temporary wooden station at Namli) having been erected. Wells had been sunk at Namli, Jaora, Dhodhar, and Dalanda stations, and the well at Jaora steined, but no tank-houses or water-cranes had been commenced. The platform walls and engine pits had been built, one staff quarter at Namli, one at Jaora, and one at Dhodhar commenced and also the station building at Jaora; but no materials had been prepared, either brick or stone, for the completion of stations, staff quarters, or watering arrangements.

The stations on the section from Mandsaur to Neemuch, Neemuch station excepted, were also in a very unfinished state on the opening on July 2nd, but the road was in fairly good order and well ballasted. At Mandsaur the station building, staff quarters, menial quarters, and goods platforms had been commenced, the well sunk, and engine pit and passenger platform finished. At Tharod the well had been sunk, and the platform wall and engine pit only built. At Mullargarh the well was sunk and steined, the staiton building, platform and engine pit finished, and one staff quarter founded only. At Harkiakhal the station building, platform, and engine pit were built, and staff quarters commenced.

None of the bridges were finished, the sloping of the wing walls, building of ballast walls, setting, coping, and painting of some girders remaining to be done.

Very little progress towards completion of roadside stations, Mandsaur to Neemuch, was made during the last rainy season for want of stone; but after receiving charge of the Neemuch Division in October last quarrying work was commenced immediately, and all stone necessary to complete stations, quarters, and tank-houses as far as Neemuch was procured and run out to site of the works.

As funds ran short in September last, the completion of the line generally has been delayed, especially as regards bridges, copings, menial quarters, level crossings, gate lodges, erection of mile and grade posts.

Having thus given a brief history of the extension of the division and the progress of capital work in connection therewith, the following report briefly on its condition generally is given :—

Earthwork.

Indore to Rutlam and Ujjain Branch. In good order and neat. About 16 miles of embankment have been made up. The high banks at Chambal and Gambhir rivers are still subsiding, and require constant attention.

Rutlam to Neemuch. All banks and cuttings, except those at Rutlam and 230th mile, have been completed, trimmed and put in good order, capital having borne the greater part of the outlay. Very slight expenditure is anticipated on formation on this part of the line.

Neemuch to Chittor. The banks have been very neatly trimmed and finished; but as they are very narrow and the earthwork new, heavy repairs during and after the rains are anticipated.

Ballast.

Indore to Rutlam. The line is fairly ballasted, and a sufficient stock is being collected to last during the rainy season.

Rutlam to Neemuch. There has been heavy expenditure chargeable to capital on this head during the year, on account of the insufficient amount provided as far as Mandsaur before the opening. The stock for next rains has been provided and charged to revenue. From Mandsaur to Neemuch a considerable amount still remains of that originally provided.

Neemuch to Chittor. About 3½ lakhs of ballast are stored for use during the rains, which, it is thought, will prove sufficient.

Permanent-way.

Indore to Rutlam. The road has been maintained in very fair order during the year, but the condition of the half-round pine sleepers from mile 86 to 98, especially at the joints, is unsatisfactory, and the renewals will be heavy. The precautions taken with regard to sharp curves have been effectual in preventing the gauge from spreading, and the same measures are now being adopted with the flat curves, *i.e.*, the reversal of sleepers and the insertion of lease plates at joints and at alternate sleepers as soon as the rails show symptoms of working wide to gauge.

Rutlam to Neemuch. The road from Rutlam to 188 miles was laid badly and handed over in very bad order. It was intended that jungle teak sleepers should be used at all joints, but in many places those were omitted. The road is now in fair running order, and has been pulled into good line in some parts. The condition of the half-round pine sleepers is bad, they having been in store for some years in this country, and when laid in, many of them were badly split. From 188 miles to Neemuch the road was well laid with hard sleepers at all joints, and handed over in good order. The pine sleepers also were in good condition when laid. As the rainfall was heavy, the length of newly opened line from Rutlam to Neemuch was maintained with some difficulty, but only one slight interruption to traffic occurred near Neemuch on the 4th of July, two days after opening. This was caused by heavy rain on three miles of quite new earthwork, which of course subsided and rendered the road impassable for some hours. The banks settled considerably near the Dhodhar, Mullani, Gungait, and Siew bridges, but by keeping a ballast train constantly at work repairs were soon effected.

Bridges.

Indore to Rutlam. All bridges, major and minor, are in good condition. The foot-ways over the Chambal and Gambhir bridges, three 150 feet spans, having been laid with 1½″ planking instead of 3″, it has been necessary to stiffen them by putting in old rails underneath on the tops of the cross girders.

All bridges, major and minor, have been completed as regards coping, decking, &c., &c., and are in fair order generally, with the exception of the timbering of the Gungiat and Mullani, each five spans of 18 metres. In these bridges the sleepers are badly spaced, and been cut and hacked unmercifully in laying the rails over them. Two rail open top culverts of six openings each at miles 178 and 184 will have to be rebuilt before the rains, as the masonry has shaken badly. Their failure is attributed by the Executive Engineer chiefly to faulty design, and also to the fact that they were run over before the mortar had time to set.

Rutlam to Mandsaur.

Mandsaur to Neemuch. The bridges have still to be coped and finished.

Station Buildings.

The station buildings from Indore to Rutlam are in good order, except that at Naugauwan, which is being rebuilt. The tiled roofs at Pahlia, Ajnod, and Fatehabad constantly require repairs, as they were built with a slope of ½ to 1, and the tiles consequently slip from the ridges. The latrine walls at Chambal, Barnagar, Runija, and Naugauwan have cracked, as reported last year; but it will not be necessary to rebuild them.

Indore to Rutlam.

Rutlam to Neemuch. All station buildings are now quite complete, and are, with the exception of the wooden structure at Namli, all flat roofed.

Neemuch to Chittor. These are not yet handed over by Construction, but are all finished, except Satkhunda.

Watering Arrangements.

The wall at Fatehabad has been sunk until a hard moorum found has been obtained, and the steining at first founded on clay with a wooden curb has been successfully under-pined. A good supply of water has now been ensured at a depth of 60 feet, as last reported. Hopes are still entertained of getting water at Harkiakhal station. The supply at Mullargarh is not certain, and may always fail in the hot weather. All watering arrangements, *i.e.*, cranes and tanks, between Rutlam and Mandsaur are complete and in good working order.

Indore to Rutlam.

Maintenance of the line.—The whole line has been maintained by revenue, except the portion between Rutlam and Mandsaur, cost of maintenance of which for three months was charged to capital. The percentage of renewal of rails during the year has been ·09, and of renewals of sleepers ·16.

Traffic Department.

The only items in which there was a considerable increase were grain and pulse, seeds, jagree and sugar, railway material and military stores. The increase in grain and pulse was partly owing to the crops being more favorable this year and partly to there being very little export in 1879 and 1880, in consequence of the stock having been reduced too low the year before on account of the famine in Madras. The increase in railway material was owing to the construction of the Neemuch-Nasirabad State Railway, and in military stores to the transfer of the arsenal from Neemuch to Mhow and the war in Afghanistan.

The earnings per goods train mile, excluding "rents and demurrage" and "miscellaneous," *viz.*, Rs. 2·62, were not so favorable as in 1879, when the earnings were as high as Rs. 3·09. This is attributed to the fact that in 1879 two mixed trains were run the whole of the distance of the open line, but in the latter half of 1880 only one passenger train beyond Fatehabad was run. The result was that it increased the coaching earning per passenger train mile from Rs. 1·95 in 1879 to Rs. 2·69 in 1880; the average earnings per train mile from goods and coaching being Rs. 2·52 in 1879 and Rs. 2·65 in 1880. The only mixed train took all the passengers, but left very little room for goods, and consequently goods trains with less than the full load had to be run occasionally to avoid excessive delay to the goods traffic.

There was a slight increase in the down empty vehicle mileage. As the down traffic is considerably in excess of the up traffic, there must necessarily be a proportionate amount of empty vehicle mileage, but theoretically there should be no empty down vehicle mileage. In the first half of 1879, to carry 4,042,450 down ton miles (column 2, Statement E) 19,636 down empty vehicle miles (column 3, Statement F) were run, while in the first half of 1880 there were 4,242,583 down ton miles and 65,362 empty vehicle miles run. According to the proportion of down empty vehicle miles to down ton miles run in the first half of 1879, the down empty vehicle mileage during first half of 1880 should have been 20,608 instead of 65,362, as mentioned above. In the second half of 1879, to carry 3,405,730 down ton miles 25,489 down empty vehicle miles were run, while in the second half of 1880 there were 4,274,891 down ton miles and 104,220 empty vehicle miles. According to the proportion of the down empty vehicle miles to the down ton miles run in second half of 1879, the down empty vehicle mileage during second half of 1880 should have been 31,994 instead of 104,220 mentioned above. This, it is considered, is owing, first, to the bulk of the down traffic going to Mhow and Indore, while the

up traffic beyond Fatehabad was in excess of the down traffic, which necessitated empty vehicles being run to stations beyond Fatehabad to carry the up traffic; and secondly, to the Khandwa yard being so limited that empty wagons had to be worked out of it to make room for loaded ones, instead of being left in yard until they were actually required for down traffic, as, of course, the down traffic was not steadily in excess of the up traffic, sometimes the up traffic being in excess of the down traffic.

Coaching traffic.—There was a net increase of Rs. 1,59,540 in passengers booked during 1880, as under :—

					Rs.
1st class	...	...	Increase	...	2,073
2nd „	...	...	„	...	3,441
3rd „	...	...	„	...	10,578
4th „	...	...	„	...	1,43,448
			Net increase	...	1,59,540

The increase in 2nd class is chiefly due to the increase in the number of troops conveyed.

Earnings per passenger train mile.—As pointed out in the remarks upon goods traffic, paragraph 47, the earnings per passenger train mile were considerably increased. The average receipts for 1880 from each passenger was about the same as last year, *viz.*, 7·55 annas, against 7·88 annas in 1879, which represents a journey of about 40 miles, and is about the distance the bulk of passengers are booked. The Indore native passengers chiefly go to the shrines at Ujjain and Mandsaur, and the shrine of Mandhatta *vid* Barwaha, Sanawad and Mirtukka. The people on the Rutlam side generally travel to Ujjain on pleasure and to Indore on business. As there is a large bazar, and people are able to get articles cheap beyond Rutlam, most of the passengers seem to book to Rutlam on business and Ujjain on pleasure.

Train mileage —The increase in the train mileage is due almost entirely to the increase in the length of line, and not to any increase in the traffic over portions of the line that were opened in the previous year.

Locomotive Department.

On the extension of the line from Neemuch to Chittor on 10th March 1881, the running shed and its staff was removed from Rutlam to Neemuch.

Rolling stock in hand.—The following represents the locomotives and rolling stock on hand on the last day of the year :—

Locomotives 54

Coaching Vehicles—

1 State saloon.
7 First class, 2 compartments.
8 „ with servants' compartments.
9 Composite, ordinary.
9 Second class, do.
1 Third class, with brakes.
11 „ without brakes.
28 Fourth class, with brakes.
71 „ without brakes.
6 Combined 3rd class and Post Office vans.
9 Carriage trucks.
10 Horse boxes.
1 Saloon tender.
41 Brake-vans.

Goods Vehicles—

2 Relief wagons, 18 feet underframe.
155 Covered goods wagons, 18 feet underframe end loading.
12 „ „ 18 feet underframe.
323 „ „ 14 feet „
75 „ „ 14 feet iron short.
8 High-sided open wagons, 14 feet underframe.
53 Low-sided wagons, iron underframe.
40 „ „ end loading.
75 „ ballast wagons.
7 Powder-vans.
15 Timber trucks, 14 feet underframe.
1 „ truck, 18 feet „
50 Iron-covered goods, military type.

In addition to the above, the following were employed on construction, and not included in the above list :—

60 Ballast wagons.
10 Low-sided end loading wagons.
1 Locomotive No. B 54.

Erection, and alterations and additions to rolling stock.—The erection of and the alterations to engines and rolling stock executed and in progress in the shops of Locomotive and Carriage and Wagon Departments on revenue and capital accounts are detailed below:—

Description of work.	Number completed during the year.	Number in progress.
LOCOMOTIVE DEPARTMENT.		
Capital Works.		
Erecting and making minor alterations and additions to and painting Neilson and Dübs' new F class engines ...	18	.....
Erecting one Fairlie engine	1	.....
CARRIAGE AND WAGON DEPARTMENT.		
Capital Works.		
Fitting carriages with Westinghouse air brakes	50	.....
„ „ brake-vans	10	.....
Converting 18-feet wagons into relief wagons	2	.....
Building 1st class carriages	.....	6
„ 2nd „	.....	5
„ powder-vans	2	.....
„ 4th class carriages	20	.....
„ iron covered goods wagons	125	.....
„ brake-vans	10	.....
„ carriage trucks	2	.....
„ horse boxes	.....	3
Making 20 sets complete brake gear for 4th class carriages ...	.....	20
Building platform wagons	25	.....
Repairing 20 ballast wagons returned from construction ...	.....	20

Repairs and renewals, to the extent of Rs. 79,000 on engines and machinery, and of Rs. 77,000 on carriages and wagons, were executed during the year 1880-81.

The work done by the Locomotive Department for other departments, including construction, amounted to Rs. 4,21,000, principally for Stores and Engineering Department.

Fuel.—The rate for wood fuel at Mhow has been Rs. 7-15 against Rs. 9 last year; that at Kalakund has increased, principally owing to the increased royalty charged by Maharaja Holkar. At Rutlam the rate is very nearly the same as last year. Firewood is being supplied for the first time at Neemuch, where the rate is high. In fact, excepting Mhow, the further the fuel depôts are from Khandwa, the dearer the firewood.

Taking into consideration the high price of wood fuel, which is increasing year by year, and the amount of compensation paid for damages from fires from sparks from engines during the last three years, and the cost of repairs, &c., done to rolling stock on account of fires, I have recently recommended to Government that it will be cheaper, under certain conditions, to burn coal than wood in engines on the line.

It was found advisable that the contract for the supply of firewood at Kalakund, Rutlam, and Neemuch should be given at the contractor's risk, the firewood remaining his property till actually taken over for consumption by the Locomotive Department. This entailed on the Railway an extra cost of eight annas per 100 cubic feet of firewood at each station, but saved Government interest on money that would otherwise have been paid when wood was stacked instead of when it is consumed, secured as from loss by fire, and also secured the stacks of being full measurement when taken over. It was always found that after the stacks had stood for some months they measured a few inches less in height.

No hopes are now entertained for supply of wood fuel by the Forest Department from the Punassa forest reserve during 1881-82, as was anticipated last year; and it appears the arrangement, pending Government order, stands over.

Oil, &c.—Boiled and raw linseed oil was obtained from the Oil Factory, Manowri, and most of the leather belting from Cawnpore.

Mileage Results for the year 1880.

Detail.		Amount.
Train mileage	Miles	511,718
Gross earnings per train mile	Rs.	2·74
Expenses „	„	2·05
Profits	„	0·69
Percentage of expenses on earnings	„	74·74
„ profits on total Capital expenditure	„	1·22
„ „ on cost of open line	„	1·40

Statement of Traffic for the year 1880.

Railways.	Total open mileage.	Passengers.					Receipts from							Working expenses.	Net profits.	European and East Indian staff.	Native staff.	Capital expenditure up to 1880,
		First Class.	Second Class.	Third Class.	Fourth Class.	Total.	Passengers.	Parcels, luggage, &c.	Merchandise, live-stock, &c.	Railway materials.	Minerals.	Miscellaneous.	Total.					
Holkar and Sindia-Neemuch Railway.	Miles.	No.	No.	No.	No.	No.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	No.	No.	Rs.
	254·49	2,667	14,247	50,431	1,064,561	1,131,908	5,34,533	45,183	6,83,010	92,155	1,633	43,846	1,401,260	1,047,269	3,53,936	155	1,014	29,01,250

HOLKAR AND SINDIA-NEEMUCH RAILWAY.

Preliminary Financial Account of Revenue and Expenditure for the official year 1880-81.

		Original Budget Estimate.	Regular Budget. Estimate.	Actuals.	Remarks.
		Rs.	Rs.	Rs.	
RECEIPTS.					
Coaching traffic		6,10,000	6,10,000	6,28,747	
Goods traffic		8,85,000	8,53,000	8,65,282	
Electric Telegraph earnings ...		3,000	5,000	5,962	
Steam-boat earnings		...	...	...	
Sundries		35,000	35,000	21,510	
Total Earnings ...		15,33,000	15,03,000	15,21,501	
Deduct—Increase in Balance of outstanding Earnings, as per Appendix A		3,000	3,000	15,768	
Total Receipts ...		15,30,000	15,00,000	15,05,733	
EXPENDITURE.					
Maintenance of way, works and stations	A	1,91,000	3,10,000	2,97,729	
Locomotive expenses ...	B	3,98,000	3,90,000	4,11,582	
Carriage and Wagon expenses	C	1,10,000	1,10,000	1,07,465	
Traffic expenses	D	1,90,000	1,80,000	1,85,311	
General charges ...	E	1,34,000	1,10,000	1,10,586	
Steam-boat service ...	F	...	...	...	
Special miscellaneous expenses	G	5,000	3,000	1,779	
Total Working Expenses ...		10,28,000	11,03,000	11,14,452	
Add—Increase to grant		...	...	...	
Increase to net debit balance of suspense account.		4,000	4,000	384	
		10,32,000	11,07,000	11,14,836	
Deduct—Increase to credit balance of demands payable ...		7,000	7,000	12,892	
Net expenditure against grant ...		10,25,000	11,00,000	11,01,944	
Net Earnings ...		5,05,000	4,00,000	4,07,049	
Net Receipts ...		5,05,000	4,00,000	4,08,789	

Sindia Railway.

The working* of the Northern Section of this line between Agra Fort and Dholpur, a distance of 34 miles, was made over to the East Indian Railway Company on the 16th December 1879, that Company to maintain the line and provide whatever rolling stock was necessary. The rates and fares are the same as those charged on the East Indian Railway.

Earnings and Expenditure—

	Rs.
The total earnings amounted to	1,22,778
„ expenditure „	57,808
Balance net earnings ...	64,970

This is divisible between the East Indian Railway and Sindia Railway in the ratio of two-fifths to the former and three-fifths to the latter.

Details are given in the table below:—

Details of Earnings and Expenses.

Earnings.		Expenditure.	
	Rs.		Rs.
Coaching traffic	88,552	Maintenance expenses	15,483
Goods „	33,107	Locomotive „	13,419
Electric Telegraph	1,119	Carriage and Wagon expenses ...	4,942
Sundries	...	Traffic expenses	9,725
		General charges	5,658
		Special and miscellaneous expenditure ...	2,889
		Additional charge of 3 annas per train mile	5,692
Total ...	1,22,778	Total ...	57,808

The earnings from—

	Rs.
Coaching traffic amounted to	88,552
Goods traffic „	33,107
The percentage on the total earnings	1,22,778
Of passenger traffic is	64·23
Of goods traffic is	26·99

Details are given in the following tables:—

Details of Passenger Traffic.

Description of classes.	Number conveyed.	Receipts.	Remarks.
1st class	1,052	3,064	
Percentage of entire passenger traffic ...	0·74	3·88	
2nd class	6,569	5,890	
Percentage of entire passenger traffic ...	4·64	7·47	
Intermediate class	940	682	
Percentage of entire passenger traffic ...	0·67	0·87	
3rd class	133,004	69,226	
Percentage of entire passenger traffic ...	93·95	87·78	
Total ...	141,565	78,862	
Percentage of passenger traffic to entire railway receipts	...	64·23	

*Administration Report by the Consulting Engineer for Guaranteed Railways, Calcutta, for 1880-81.

Details of Goods Traffic.

Description of goods.	Weight carried.	Receipts.	Remarks.
Merchandise—	Tons.	Rs.	
For the public	14,862	23,232	
Military stores	782	1,978	
Railway materials	15,832	4,536	
Minerals—			
For the public	1,481	2,847	
For Construction	53	29	
Live-stock	...	319	
Rent, demurrage, &c.	...	166	
Total ...	33,010	33,107	
Percentage of goods traffic to entire railway receipts ...	...	26·97	

Dhond and Manmad Railway.

This line* was worked as a State line till 31st December 1880, when the G. I. P. Railway Company took over the working on terms of which the following is a brief summary:—

The railway to be completed by Government, permanent buildings being substituted for temporary as funds can be made available.

The G. I. P. Railway Company to find locomotives and rolling stock; work the traffic and telegraph; collect the revenue and manage the railway, except in respect to construction works, as if it were part of their own line.

The G. I. P. Railway Company to maintain the line in good order.

Rates and fares to be the same as on the main line of the G. I. P. Railway.

The G. I. P. Railway to pay to Government a percentage of the gross earnings, calculated at 20 per cent. on gross earnings amounting to 5 lakhs or less, and rising by increments of one per cent. per lakh earned beyond that amount; with a proviso that the Company will not be required, at any time, to work the line at a less percentage rate than 10 per cent. in excess of the mean rate on their own line for the year.

Agreement to be for a term of years not yet fixed.

As there was a pressing demand for engines, rolling stock and shop machinery on the Punjab Northern Railway, the whole of the stock and machinery of the Dhond and Manmad line was transferred to that line in the months of November, December and January last, the G. I. P. Railway Company supplying locomotives and rolling stock on hire for working the line during November and December 1880.

The principal works which have been carried out during the year are the watering arrangements at the different stations and the building of the Ahmednager and Yeola booking offices and goods sheds, &c.

The earthwork, ballasting, and permanent-way are completed: since 1st January 1881 the maintenance of the line has been carried out by the G. I. P. Railway.

All bridges and culverts throughout the line are complete in every respect, and all diversions have been lifted.

The earnings and expenditure of the two years compare as follows:—

Main heads.	1880.	1879.	Increase.
	Rs.	Rs.	Rs.
Gross earnings	6,95,094	4,67,557	2,27,537
Gross expenditure	6,06,875	4,95,221	1,11,654
Net earnings ...	88,219	—27,664	1,15,883

From this it will be seen that the net earnings for 1880 have improved by Rs. 1,15,883 over those for 1879, but a portion of this favorable result is due to the line having been kept open throughout the year, whereas in 1879 traffic was interrupted during the monsoon months.

* Administration Report of the Railway Department, Bombay Presidency, for 1880-81.

CENTRAL PROVINCES.

The two lines worked under the administration of the Central Provinces during the year were the Wardha Coal Railway and the Nagpur and Chhattisgarh line.

The amalgamation of the Warora coal mine with the Wardha Coal Railway took place last year, so that both these undertakings are included under one head in this year's accounts. The Colliery works, on which the railway is mainly dependent, having been closed for some months owing to a breakdown in the pumping machinery, a loss of nearly two lakhs has resulted in the joint working.

The following extracts from the Administration Report of the Central Provinces give details of the working for the year under review :—

Wardha Coal Railway.

In connection with the Railway itself, the expenditure debitable to capital was on account of the completion of some staff quarters and improvements to workshops, and a further supply of rolling stock.

The following statement shows the capital account as it stood at the end of the year :—

Main heads of expenditure.	Official year, 1880-81. Budget Estimate.	Regular Estimate.	Outlay.	Deduct receipts on Capital account.	Net expenditure.	Net expenditure to end of previous year.	Net expenditure to end of 1880-81.	Sanctioned Estimate.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Preliminary Expenses	.....	.....	.....	.....	.....	91,643	91,643	
Land	.....	.....	.....	.....	.....	4,655	4,655	
Construction of line ...	.....	—200	—292	264	—556	15,73,049	15,72,493	
Ballast and Permanent-way	.....	.....	.....	.....	.....	20,49,835	20,49,835	
Stations and Buildings ...	.....	.....	4,363	.....	4,363	3,40,601	3,44,964	
Warora Colliery works ...	.....	.....	.....	.....	.....	3,38,225	3,38,225	
Total Construction accounts ...	.....	—200	4,071	264	3,807	43,98,008	44,01,815	
Plant	.....	.....	1,514	.....	1,514	3,51,512	3,53,026	
Steam ferries	.....	1,26,200	1,13,597	.....	1,13,597	1,74,183	2,87,780	
Rolling stock	.....	.....	764	.....	764	6,07,557	6,08,321	
Establishment	.....	.....	.....	.....	.....	.....	.....	
Total expenditure on Final Heads ...	.....	1,26,000	1,19,946	264	1,19,682	55,31,260	56,50,942	
Suspense accounts	.....	.....	13,634	.....	13,634	1,10,045	1,23,679	
Grand Total Expenditure ...	.....	1,26,000	1,33,580	264	1,33,316	56,41,305	57,74,621	

The distribution of outlay showing how chargeable was as follows :—

	Productive Public Works Outlay.		Ordinary Outlay.		Grand Total.
	Imperial.	Provincial.	Imperial.	Provincial.	
	Rs.	Rs.	Rs.	Rs.	Rs.
During the year	80,255	...	...	...	80,255
To close of year	44,07,016	...	6,67,447	...	50,74,463

The total capital account to end of year for both works stood at Rs. 57,74,621, of which Rs. 1,23,679 were in suspense.

During the year thirty-five 10-ton covered wagons were supplied from the Bombay, Baroda and Central India Railway workshops; but, owing to the inferior workmanship and material of their wheels and axles, many of them were frequently unable to run. Yet they did good work and paid well, the Manager reporting that the earnings therefrom on account of mileage and demurrage on foreign lines amounted to 16 per cent. on their cost. Sixty 10-ton iron coal wagons were also received from England, and were erected locally at the workshops of the Railway. These have proved so useful and satisfactory, that sixty more have been sanctioned.

At the Colliery the cost of all new works carried out was debited to revenue. These consisted of works at Nos. 3 and 4 pits, and also the purchase of the Attock engines* and pumps (which, under orders of the Government of India, were transferred to this Colliery from Attock), and the collection of materials for the erection thereof.

The following is an account of the working of the Railway and Colliery :—

Main heads of expenditure.	Budget Estimate, 1880-81.	Regular Estimate, 1880-81.	Actuals, 1880-81.
I. RECEIPTS.	Rs.	Rs.	Rs.
Coaching traffic	36,000	24,000	29,402
Goods traffic	2,04,000	73,000	83,910
Electric Telegraph	1,000	1,000	976
Sundries	5,000	5,000	17,971
Warora Colliery	3,04,000	1,07,000	1,15,825
Total Earnings ...	5,50,000	2,10,000	2,48,084
II. EXPENDITURE.			
Maintenance	32,500	24,000	24,343
Locomotive expenses	30,000	24,000	27,179
Carriage and Wagon expenses	9,000	6,000	8,342
Traffic expenses	21,000	24,000	22,458
General charges	16,000	30,000	34,998
Special and miscellaneous expenditure	.....	9,000	6,837
Working expenses, Warora Colliery	1,66,500	3,12,000	3,19,731
Total Working Expenses ...	2,75,000	4,29,000	4,43,888
III.			
Net results	2,75,000	—2,19,000	—1,95,804

The net results shew a loss of Rs. 1,95,804, due to the Colliery works, which were closed again for several months' as explained hereafter. As the success of the Railway is, it may be aid, entirely dependent on the successful working of the Colliery, if the latter fails the former also must. A very large amount of the deficiency, however, is due to the cost and carriage of the Attock engines, and was no real loss to Government, as the former was merely a debit of money previously expended to a new head. Loss was also due to the heavy expenses attendant on the mines when closed, the cost of new boilers, &c., and the overhauling and refitting of the machinery.

In April 1880, the machinery at the Colliery was found to be in a bad state and frequent stoppages occurred, no relief being available from the new pumping arrangements at No. 3 pit, owing to their being yet incomplete, though originally expected to be at work by November 1879.

All was again in working order by the 24th July, or in about three months, when further defects were discovered in what is called "the new set" of pumps, and the clack door fifty feet below water level was found to be leaking. Divers were sent for from Bombay, and two Europeans and two natives were sent up. One European prepared to descend, but before he had gone down many feet he turned over and had to be hauled out. A native of the Punjab then descended and succeeded in stopping the leak. Another time this man succeeded in taking off the clack door and bringing up the clack valve from a depth of upwards of forty feet in water. It was then discovered that a piece of the brass lining of the working barrel of one of the pumps, which was known to have fallen some time before, was lodged in the clack. This was late in September, and the pump, as the working barrel could not be renewed till the water was out, was useless. However, the water was out on 29th September, and the working of the mines commenced again on the 4th October. From that time to the end of the year upwards of 21,000 tons of coal were raised.

Whilst the above work was going on in July, and all hands were fully employed, unfortunately the secondary shaft of No. 3 pit pumping engine broke, and the work at this pit was also stopped. Work was, however, resumed as soon as possible, and the pit was sunk and connected with the main works by December.

* A pair of 35-H.P. beam Cornish engines by Maudslay, Sons and Field sent to Attock in connection with the works of the tunnel under the river Indus.

No. 4 pit, which has no pumps, as it was arranged that it should be drained into the original workings, was also flooded when the main works were stopped; but as soon as circumstances permitted, a drift was run under it, and a bore hole put down, which effectually drained it. The pit was fully sunk in February. Now about 50 tons a day are being raised therefrom.

The engines and pumps from Attock, as before observed, were transferred to the Warora Colliery, and after full consideration it was decided to put them down in No. 3 pit, which will be the main pumping pit.

This pit will, it has been shown, drain some 190 acres, containing about 2,313,000 tons of good workable coal, of which, at a low calculation, 1,600,000 tons can be got out.

Supposing the demand rises to 10,000 tons monthly, or 120,000 tons annually, this coal will last some twelve or thirteen years. The arrangements now being made will admit of from 400 to 500 tons of coal being raised daily. The pumping arrangement now being carried out will, it is understood, remove all chances of stoppages or breakdowns as far as can be foreseen.

There remains now only to notice the actual working of the Railway.

The receipts from passengers show a slight increase over those in the previous year, or Rs. 507; but this was due only to the last quarter, when the rate for 4th class passengers was reduced from 2½ pies to 2 pies per mile under Government of India circular No. XIII, dated 1st July 1880, and two mixed trains were run daily, which enables many passengers to return to their homes on the day of departure therefrom. Market or bazaar return tickets were also issued at 1½ pies per mile. The results showed receipts amounting to Rs. 8,398, against Rs. 6,249 in the corresponding quarter of the previous year, and it is understood that since the 1st of April the passenger traffic has still further developed.

The receipts from goods was Rs. 14,478 less than in the previous year, but this was due to the smaller receipts from coal.

The receipts from the Colliery were Rs. 13,960 less than in the previous year, due to the closing of the mines. Only 25,696 tons were raised against 32,099 tons in 1879-80. The results were 19,370 tons large coal and 6,326 tons small, the latter being 24·61 per cent. of the whole.

As much coal was not raised after the mines were again open in October as was hoped, owing to the coal in No. 2 seam worked in connection with No. 1 pit running out to the rise, and additional faces, which had been calculated on, not being available in No. 4 pit. It was however arranged, with a view of making up for the loss of the face workings to the rise, that some of the pillars should be taken out. This, however, was not carried out to the extent anticipated, and the supply was consequently limited.

Nagpur and Chhattisgarh Railway.

On the 6th April 1880 the line was opened for goods traffic only between Nagpur and Tumsar, 53 miles. There being no coaching vehicles available, it was not opened for passenger traffic until later on, *viz.*—

	Miles.	Date of opening.
Nagpur to Kampti	9	26th July 1880
Kampti to Tumsar	44	8th Nov. 1880

Since the close of the official year the line has been opened for general traffic to Amgaon, 81st mile.

Extension surveys were made from Dongargarh, the terminus of the line, to Bilaspur *vid* Raipur, and work was commenced on the section from Dongargarh to Nandgaon (19 miles). The question of the extension of the line beyond Bilaspur to join the Bengal system of railways was also taken under consideration.

As will be seen from the extracts given below from the Central Provinces Administration Report, the results of first opening were disappointing and the traffic was not large. Many causes, however, tended to this depressing effect. The fact of the line not being opened for coaching traffic operated unfavorably. The failure of the supply of Warora coal, owing to the breakdown of the pumping machinery and the sinking of the black cotton soil banks when once the rains set in, practically suspended traffic altogether for a time.

Later in the year, however, the goods and coaching traffic developed, and a reduction of fares has run the large cart traffic off the road between Nagpur and Kampti. And it is expected that next year's working will yield 4 per

cent. on the capital outlay. It would be, however, premature to draw any general conclusion from the results hitherto obtained on so young a line.

The traffic was not large. This was possibly influenced by the line not being open for passenger traffic. The advantages to construction were, however, considerable.

When the rains set in, the line being new, and principally running through black cotton soil country, the banks sunk considerably, stopping traffic for a time; and this, with the non-supply of Warora coal or cheap fuel, necessitated virtually the temporary closing of the line; but the temporary opening is believed to have influenced the traffic of this season, which has been considerable. The merchants, no doubt feeling certain of the line being available, made their arrangements accordingly.

The tariff of rates adopted at first was that prevailing on the Great Indian Peninsula Railway, but modifications were made at times as found necessary.

In July the portion of the line between Nagpur and Kampti was passed for passenger traffic, temporary carriages being made up from the 14 feet covered goods wagons.

The passenger mileage rates were at first fixed at 18 pies for 1st class, 9 pies for 2nd, and 2½ pies for 4th; but under Government of India circular No. XIII Railway, dated 1st July 1880, the latter two were modified, as follows:—

2nd class	...	...	8 pies per mile.
4th „	...	...	2 „ „

No 3rd class carriages were provided.

The passenger traffic developed so largely between Nagpur and Kampti, that additional temporary arrangements for vehicles had soon to be made.

The line was further opened for passengers to Tumsar in November, and a diversion with temporary bridge across the Wain Ganga having been completed, it was opened for general traffic to Tirora in February, and again on to Amgaon, 81st mile, in April 1881, the construction of the line having been commenced in July 1878.

The following statement shows the results of the working of the line, or a net profit of Rs. 40,035, which, considering the numerous drawbacks that existed, may be considered as satisfactory.

It is understood that the results of the working of the half-year up to 30th June 1881 will be close on 4 per cent. on capital sunk on open portion.

Main heads of expenditure.	Budget Estimate, 1880-81.	Regular Estimate, 1880-81.	Actuals, 1880-81.
I.			
Receipts.	Rs.	Rs.	Rs.
Coaching traffic	No details.	22,830	38,753
Goods traffic		1,20,780	1,23,060
Electric Telegraph		230	409
Sundries		160	228
Total Earnings ...	1,00,000	1,44,000	1,62,450
II.			
Expenditure.			
Maintenance	No details.	...	...
Locomotive expenses		44,000	50,228
Carriage and Wagon expenses ...		10,000	13,739
Traffic		30,000	31,993
General charges		18,500	26,044
Special miscellaneous expenditure		500	411
Total Working Expenses ...	1,00,000	1,03,000	1,22,415
III.			
Net results	...	41,000	40,035

The traffic developed very considerably during the last three months.

The merchants at Tumsar, having had a short experience of the benefits of the Railway towards the end of the season of 1879-80, collected their consignments at Tumsar, and the Railway carried a very large quantity of grain from that station.

As it was found that, with the Great Indian Peninsula Railway rates for carriage of grain, carts could compete with the Railway between Kampti and Nagpur, a very considerable reduction therein was found necessary, and rates of 6 pies per maund per mile, including terminals, for through traffic and 7 pies for local traffic were fixed on. This led to a very considerable increase of traffic, and the result has been that the cart traffic on the road between the two stations has nearly ceased. Special reductions were also found necessary on account of hides and salt, which also proved satisfactory.

The terminal on through booking charged by the Great Indian Peninsula Railway Company objected to by this Administration on signing the agreement for intercharge of traffic is yet in force, and no doubt unduly influences the receipts of the Government railway.

The expenditure or working charges were, no doubt, heavy in proportion to the receipts; but it must be remembered that the line was virtually closed for some months, though establishments had to be maintained, and the working expenses on the first opening are invariably heavy compared with those on an established line. Maintenance was duly kept up at the cost of capital, but on the 1st April 1881 the whole of the works up to Tumsar were handed over to the Manager of the line, and the first division was abolished.

The whole of the rolling stock, engines and wagons, were made up locally in the workshops of the line, and have answered very satisfactorily.

BRITISH BURMA.

Rangoon and Irrawaddy Valley Railway.

The Rangoon and Irrawaddy line was worked throughout the year with very satisfactory results, as is shown by the following extract from the Administration Report for Burma for the year:—

Revenue.

	Rs.
The earnings for the year ending 31st March 1880 amounted to	14,11,460
The expenses to	8,59,532
Leaving a net profit of	5,51,928

Thus the net earnings were 4·47 per cent. on the capital of Rs. 1,23,41,127 expended to that date, and the working expenses nearly 61 per cent. of gross receipts.

This result is a great improvement on that of the previous year, and better even than was expected.

The passenger traffic shows an increase at the rate of 6 per cent., and the goods traffic at 85 per cent., over that of the year 1880-81.

There is every prospect of the goods traffic improving steadily; but the passenger traffic has probably reached its maximum, and will only increase slowly with the population of the country.

The result of the year's working of the suburban lines which were finished during the year has also been on the whole very satisfactory. The local passenger trains between Insein and Pozoondoung do not yet pay their working expenses, but there has been a steady improvement in the number of passengers using them, and there is a reasonable prospect of their becoming fairly profitable in course of time.

The goods traffic on the suburban lines has been heavier than was expected, and quite justifies their construction.

A large demand for the laterite obtained from the Wanet stream quarry has sprung up in Rangoon for metalling purposes, and it is proposed to quarry and deliver about 12 lakhs of cubic feet in the ensuing season. It has been necessary to provide additional siding accommodation at Wanet stream, and more open trucks are required for this traffic, which gives a very acceptable addition to the traffic receipts in the slack season.

Besides 56,000 cubic feet used as ballast on the line itself, 702,200 cubic feet of laterite was quarried during the year at the Wanet stream quarry, of which—

211,360 cubic feet were issued to the Rangoon Municipality and the Public Works Department.
266,710 „ was issued for revenue works and maintenance of permanent-way.
224,130 „ were left on hand at quarry.

ASSAM.

No railways have yet been constructed in Assam. But the ensuing year will probably see a development of railway enterprise in both the Upper and the Lower Assam Valleys.

NATIVE STATES.

Bhopal Railway.

The Bhopal line is still under construction, and the Bhavnagar-Gondal Railway has been so recently thrown open to traffic, that it will suffice to say that the section from Bhavnagar to Wadhwan, 105 miles, was opened by His Excellency the Governor of Bombay on the 20th December 1880, and the section from Dhola to Dhoraji, 87½ miles, on the 18th January 1881.

Bhavnagar-Gondal Railway.

The earnings and expenditure from date of opening to 31st March 1881 were respectively Rs. 1,31,008 and Rs 1,03,094. The train mileage run was 61,603, which gives the cost per train mile Rs 1·68.

Satisfactory results are anticipated during this year's working.

Gaekwar of Baroda's Railway.

The following extracts from the Administration Report of the Railway Department, Bombay, show the satisfactory results achieved in the working of the Gaekwar of Baroda's Railway :—

The line from Goa Gate, Baroda, to Dabhoi was opened on 1st July 1880 ; and from Goa Gate to Vishwamintri, 1⅞ miles south of the Baroda station of the Bombay, Baroda and Central India Railway Company, on 24th January 1881.

It has been proposed that the electric telegraph should be erected along these lines to facilitate working. At present they are worked on the staff and ticket system. The Baroda Administration has not yet determined on the change.

The working of these lines continues to give satisfactory results. During the whole year 1880 the net revenue gave a return of 7·31 per cent. on the capital expended.

Khamgaon and Amraoti Railways.

These two lines are known as the Berars branches, because they were constructed out of the surplus revenues of the Berars, in order to convey the cotton from the marts of Khamgaon and Amraoti. They were originally worked by the Great Indian Peninsula Railway Company until the 31st December 1878, when they were handed over to State agency. On the 1st November 1880 the working of them was once more made over to the Great Indian Peninsula Railway. The following figures show the receipts and expenditure on each branch :—

KHAMGAON RAILWAY.

Receipts.

	Rs.
From April 1st, 1880, to March 31st, 1881 ...	16,098
Expenditure.	
Working charges from 1st April 1880 to 31st March 1881 } Maintenance ... ... }	25,121
Net loss	9,023
Or equivalent to 1·82 per cent. on the capital outlay of	4,94,271

AMRAOTI RAILWAY.

Receipts.

During same period as on Khamgaon Railway ...	39,418
Expenditure.	
Working charges } for same periods ... ... Maintenance }	55,038
Net loss	15,620
Equivalent to 3·50 per cent. on the capital outlay of	4,45,663

Statement showing the (Capital) Income and Expenditure on Productive Works in the Hyderabad Assigned Districts for the year 1880-81.

Name of Railway.	Whether received from Native Government or wholly made by British Government.	Capital expenditure from Berar revenues.	Receipts and expenditure during the year.					Remarks.
			Gross income.	Cost of establishment.	Cost of repairs and maintenance.	Charges for interest.	Net surplus and deficit.	
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Khamgaon Railway	Wholly made by British Govt.	4,94,271	16,098	...	...	2,43,460	...	
Amraoti Railway		4,45,663	39,418	...	...	2,01,967	...	
Total ...	...	9,39,934	55,516	...	...	4,45,427	...	

Name of Railway.	Mileage opened during the year.	Total miles opened.	Passengers during the year.				Receipts from passengers.	Receipts from merchandise.	Receipts from railway material.	Total receipts during 1880-81.	Maintenance and working expenses during 1880-81.	Net profits.	No. of European staff.	No. of Native staff.	Total capital expenditure.
			1st Class.	2nd Class.	3rd Class.	4th Class.									
							Rs.	Rs.	Rs.	Rs.	Rs.	Rs.			Rs.
Khamgaon Railway ...	7·53	7·53			...	*	...	...	...	16,098	25,121	—9,023	*	*	4,94,271
Amraoti Railway ...	5·5	5·5			...	*	...	...	...	39,418	55,038	—15,620	...	...	4,45,663

Particulars cannot be furnished, as the line was worked by the Great Indian Peninsula Railway Company from the 1st of November 1880.

Nizam's Railway.

The maintenance and working of this line continued to be carried on by Government during the year.

The following works chargeable to Capital were carried out during this official year, the capital outlay being Rs. 2,00,937 :—

Construction of line.

(1) Pitching Hussain Sagar Tank.

Stations and Buildings.

(2) Covering in space near locomotive shed, Secunderabad.
(3) Gulaguda station.
(4) Goods-shed at Tandur.
(5) Water-supply at Wadi.
(6) „ at Hyderabad.

Plant.

(7) Locomotive machinery.
(8) Station and office furniture.

Rolling Stock.

(9) Locomotive stock.
(10) Carriage and Wagon stock.

The following table compares this year's receipts and expenditure with those of 1879 :—

		1880.	1879.	Increase.	Decrease.
		Rs.	Rs.	Rs.	Rs.
Receipts	Coaching ...	3,08,770	3,00,359	8,411	...
	Goods and Sundries ...	3,93,946	3,94,042	...	96
Total Receipts ...		7,02,716	6,94,401	8,315	...
Expenditure ...		4,78,406	6,04,476	...	1,26,070
		2,24,310	89,925	1,34,385	...

This net profit of Rs. 2,24,310 is equivalent to 1·86 per cent. on the total capital outlay of Rs. 1,22,93,686.

Mysore Railway.

On the 1st October 1880 the broad gauge line (3 miles) from Bangalore cantonments to Bangalore pettah or city was handed over to the Madras Railway, to be maintained and worked by that Company as an integral portion of their system.

On the 1st February 1881 the section between Bangalore and Channapatna (35 miles) was opened for traffic. On the 20th March 1881, at the time of the installation, a further length of 23 miles as far as Mandya was opened for passenger traffic.

This leaves 28 miles of line to complete. Construction on this is being continued, and it is expected that the line will be open through to Mysore by the 1st January 1882.

The traffic on the line has not yet had time to develop, but it is interesting to note that during February and March 21,963 passengers used the line, the total earnings on which were Rs. 13,224.

EAST INDIAN RAILWAY.

East Indian Railway.

The following report has been furnished for the East Indian Railway by the Consulting Engineer for Guaranteed Railways at Calcutta for the year under review :—

The original contract* between the East India Company and the East Indian Railway Company having expired on the 31st December 1879, the property constituting the undertaking of the East Indian Railway and the works and conveniences connected therewith were handed over to Government on that date.

The Jubbulpore extension having been amalgamated with the main line of the East Indian Railway, both these lines are treated in this report as one undertaking.

The length of line constituting the undertaking on which rates and fares are calculated is 1,504·32 miles, of which 410·59 miles are double. The total length of single track, including sidings, is 2,233·64 miles.

The total withdrawals under the original contract from the Treasury up to the 31st December 1879 amounted to—

	Rs.	A.	P.
On account of the main line	30,17,91,541	6	3
„ „ Jubbulpore line	3,79,62,343	8	0
Total ...	33,97,53,884	14	3

and is made up as follows—

	Rs.	A.	P.
Construction expenditure up to the 31st December 1879	32,94,21,094	5	6
Value of stores in hand to be transferred to the new undertaking	76,99,512	8	10
Value of surplus stores to be made over to Government	16,63,208	7	0
Expenditure not finally passed, in suspense	8,91,752	8	3
Cash balance to be brought forward with the new undertaking	78,317	0	8
	33,97,53,884	14	3

The old capital account having been closed, the capital of the undertaking may be defined as—

	Rs.	£
The Capital Stock on 1st November 1879		26,200,000
25 per cent. added thereto by Purchase Act		6,550,000
Debenture Stock on 31st December 1879		1,500,000
Debenture Debt		2,950,000
		37,200,000
or, excluding the Terminable Annuity		27,623,386
		9,576,614
Less—		
Value of stores received from the old Company on 31st December 1879	766,534	
and cash and other assets of the old Company on 31st December 1879	82,217	
		848,751
		8,727,863
To which may be added the amount of overdrawn capital on 31st December 1879		264,527
Total at close of 1879		8,992,390
Debenture Debt paid off in 1880		1,000,000
		7,992,390
Capital expenditure during 1880		29,505
Total at close of 1880		8,021,895

* The new contract is printed *in extenso*, see Appendix B.

Construction works.—The following are the principal works of construction completed during the year:—

(*a*) The remodelling of the inward and outward goods sheds at Howrah.
(*b*) Lighting the outward goods shed by electricity.
(*c*) Additional engine and tank-house at Howrah.
(*d*) Additional landing stages at Howrah.
(*e*) Additional sidings for coal traffic at Howrah.
(*f*) Junction arrangements at Bankipore for the Patna and Gya line.
(*g*) Watering arrangements at Sutna.
(*h*) Branch line from Cawnpore station to the corn market in the city.

Maintenance.—The way and works have been maintained in an efficient manner throughout the line. The relaying of the line with steel rails has made fair progress; but the steel rails in stock having run out, the work of relaying has been stopped for the present. In future relaying with steel rails will be confined to the main line below Allahabad. Satisfactory progress has also been made in putting in the additional rail bearings, particularly on the loop line portion of the Howrah district; but for want of chocks equal progress could not be made in other districts.

The following statement shows the progress made in relaying the line with steel rails:—

Names of districts.	Length of road laid with steel rails.	Length of road laid with iron rails.
	Miles.	Miles.
Howrah District	133·45	167·25
Chord Line District	29·87	380·87
Dinapore District	9·64	411·84
Allahabad District	12·61	42·463
Delhi District	14·26	329·50
Total ...	199·83	1,714·09

The following statement shows the progress made in putting in the full complement of sleepers:—

Names of districts.	Total length of road laid with full complement of sleepers.	Total length of road under-sleepered.
	Miles.	Miles.
Howrah District	171·46	129·24
Chord Line District	397·99	12·81
Dinapore District	2·36	419·12
Allahabad District	236·17	201·07
Delhi District	74·75	269·01
Total ...	882·73	1,031·25

The cost of maintenance—

		1879.	1880.
Per mile for month was	Rs.	240-9-11	244-3-0
Number of wooden sleepers renewed	No.	390,242	291,558
Number of ordinary and steel rails renewed	No.	36,265	31,134

Locomotive Department.—The erection of 16 new engines, in addition to the 50 completed last year, was commenced in August last, and the work is in a forward state. Some little delay in their erection was occasioned in consequence of the materials required from England not having arrived in time.

The locomotive stock and workshop machinery has been maintained in good working order.

The average daily train mileage run by the engines was—

	1st half.		2nd half.
In 1879 ...	53·00		44·37
„ 1880 ...	50·00		47·25
Decrease ...	3·00	Increase ...	2·88

The consumption of coal per train mile in pounds was—

		ENGINES.		
		Passenger.		Goods.
In 1879	...	37·27		50·98
„ 1880	...	38·82		50·85
	Increase ...	1·55	Decrease ...	0·13

During the year 14 engines were condemned. The following table gives the age and mileage run by each :—

Number of engines.	Age.		Train miles.	Engine miles.
	Years.	Months.		
13	23	9	295,279½	306,493¼
20	23	2	227,932	254,353¼
91	18	5	262,235	278,715¼
94	18	4	228,932	237,883½
306	20	4	25,161¼	270,735
5	25	0	221,183	258,165
12	23	8	310,914	323,174¾
15	22	11	252,466¾	279,627¾
81	22	6	184,763¼	216,653¾
86	21	6	225,483	252,142
95	18	5	213,527½	222,512½
110	25	0	174,219¼	382,126¼
116	23	2	113,803	285,052
192	17	10	286,894¼	335,822

The native drivers and shunters continue to work satisfactorily. There are now 106 native drivers and 117 native shunters, total 223, working on running engines.

The scheme for employing natives as drivers and shunters has now been tried for six years, and the results appear very satisfactory. A saving of Rs. 15,95,925 has been effected during this period in salaries and overtime allowances alone.

The cost of enginemen, firemen, and all labour connected with running engines was—

		Rs.	Engine-miles.
In 1879	... ...	11,14,719	9,716,346
„ 1880	... ...	10,71,742	8,983,821
	Decrease	42,977	732,525

The Kurhurballie and Serampore Collieries yielded—

		Tons.
In 1879	... ...	287,177
„ 1880	... ...	257,860
	Decrease ...	29,317

Carriage and Wagon Department.—The rolling stock and workshop machinery have been efficiently maintained.

In view of the proposed reduction of rates, Mr. Pearce, the Superintendent of the Carriage and Wagon Department, designed and constructed a carriage capable of comfortably seating 180 third class passengers. The body of this carriage is 58 feet 9 inches long, carried on two bogie trucks, 44 feet centres, with three compartments of the ordinary type at each end, the centre of the body having an upper and a lower storey. The carriage is now being run experimentally on local trains.

The advantages are that it weighs about as much as two ordinary third class carriages, costs about as much, and carries as many as three ordinary third class carriages. It also reduces the train about 30 feet.

The disadvantages are that the upper compartment is hotter than the compartments of an ordinary third class carriage, the lower, from its position, necessarily attracts a larger quantity of dust in the dry season, and it cannot be utilised for the conveyance of troops. The carriage is, however, likely to be extensively patronised by natives on the suburban trains.

The working expenses (repairs and oiling) per train-mile amounted to—

	As.
In 1879	2·45
„ 1880	3·06
Increase ...	0·61

The vehicles renewed and turned out were—

	No.	Rs.
In 1879	194 at a cost of	1,89,822
„ 1880	312 at a cost of	3,29,125

At the end of the year the total number of vehicles running on the line was 8,712.

Telegraph.—The lines of telegraph have been efficiently maintained.

Accidents.—There were no accidents of a serious nature during the year.

On the 16th February, as the 4-5 o'clock branch line train was working up the incline to Giridi during a storm, 30 wagons were blown out of a siding and came into collision with it. The Company's servants who were in fault were prosecuted and punished.

On the 2nd June, No. 24 down goods train came to a stand on the top of the Neemcha bank, and running back came into collision with No. 48 down goods train, which was following. Considerable damage was done to the rolling-stock.

On the 29th November, a pilot engine, with 17 wagons attached, collided with No. 39 up passenger train, which was being shunted at Howrah. A gunner was in fault and was punished.

The accidents to life and limb during the year were as follows:—

	Fatal.	Not fatal.
Passengers	8	28
Railway servants	11	34
Contractors and ballast coolies	12	25
Policemen	1	1
Trespassers and others	43	13
Total	75	101

The eight fatal cases of accidents to passengers were of people jumping or falling from trains in motion; all of them were natives. Of the forty-three fatal cases classed under trespassers, three are supposed to have been suicides.

Earnings and Expenditure.—Exclusive of the Flotilla—

	Rs.
The total earnings amounted to	4,29,14,429
„ expenditure „	1,41,53,658
Balance net earnings ...	2,87,60,771

Details are given in the table below:—

Abstract of Earnings, Expenses, and Profits.

Years.	Miles open.	Train miles (Traffic Department).	Earnings.	Expenses.	Profits.	Per mile open.			Per train mile.			Percentage of working expenses to earnings.	Percentage of profits on capital expended.	Capital on which guaranteed is paid, or paid up capital.	Rate per cent. of profits on total capital paid up.
						Earnings.	Expenses.	Profits.	Earnings.	Expenses.	Profits.				
			Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.			Rs.	
1876	1,503·15	7,104,273	3,54,43,718	1,24,34,645	2,30,09,073	23,579·63	8,272·39	15,307·24	4·99	1·75	3·24	35·08	7·12	33,11,88,698	6·95
1877	1,503·15	8,852,482	4,43,06,208	1,40,40,136	3,02,66,072	29,475·56	9,340·47	20,135·09	5·00	1·58	3·42	31·69	9·34	33,58,39,222	9·00
1878	1,504·31	8,064,980	3,97,36,891	1,41,57,895	2,55,78,996	26,415·36	9,411·55	17,003·81	4·93	1·76	3·17	35·63	7·86	33,65,17,134	7·60
1879	1,504·31	8,255,606	4,32,87,420	1,42,03,061	2,90,84,359	28,775·59	9,441·57	19,334·02	5·24	1·72	3·52	32·81	8·83	33,68,69,417	8·63
1880	1,504·32	7,944,520	4,29,14,429	1,41,53,658	2,87,60,771	28,527·46	9,408·67	19,118·79	5·40	1·78	3·62	32·98	The old Capital account has been closed.		

N.B.—The steamer traffic has been excluded from this table, except in the two columns giving percentage of profits on capital expended and capital paid up.

The earnings from—

	Rs.
Coaching traffic amounted to	1,16,73,269
Goods traffic ,, ...	2,98,32,892
The percentage upon the total earnings	4,29,45,116
Of coaching traffic is	27·18
Of goods traffic is	69·47

Details are given in the following tables :—

Details of Passenger Traffic.

Description of classes.	Number conveyed.						Receipts.					
	1879.	1880.	Increase in 1880.	Decrease in 1880.	Increase per cent.	Decrease per cent.	1879.	1880.	Increase in 1880.	Decrease in 1880.	Increase per cent.	Decrease per cent.
							Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1st class	48,289	43,563	...	4,726	...	9·79	5,00,977	5,17,626	16,649	...	3·32	...
Percentage of entire passenger traffic...	0·57	0·51	...	...	...	...	5·03	5·00	...	...	...	...
2nd class	161,626	152,022	...	9,604	...	5·94	6,89,658	7,23,021	33,363	...	4·84	...
Percentage of entire passenger traffic...	1·93	1·77	...	...	...	...	6·93	6·98	...	...	...	...
Intermediate class ...	581,173	600,559	19,386	...	3·34	...	4,38,834	4,67,417	28,583	...	6·51	...
Percentage of entire passenger traffic...	6·92	6·99	...	...	...	...	4·41	4·52	...	...	...	...
3rd class	7,603,426	7,792,724	189,298	...	2·49	...	83,23,737	86,45,980	3,22,243	...	3·87	...
Percentage of entire passenger traffic...	90·58	90·73	...	...	...	...	83·63	83·50	...	...	...	...
Total ...	8,394,514	8,588,868	194,354	...	2·32	...	99,53,206	1,03,54,044	4,00,838	...	4·03	...
Percentage of passenger traffic to total railway receipts ...	...	...	...	...	...	...	23·02	23·61	...	...	...	...

The average load in tons of each —

	1879.	1880.
Goods train was	149·50	149·00
,, wagon was	6·92	6·98

Details of Goods Traffic.

Description of goods.	Weight carried.				Receipts.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Tons.	Tons.	Tons.	Tons.	Rs.	Rs.	Rs.	Rs.
Merchandise—								
For the public	2,053,248	1,774,696	...	278,552	2,45,04,260	2,36,31,467	...	8,72,793
Military stores	21,650	14,233	...	7,417	6,98,265	5,02,212	...	1,96,053
Telegraph stores	...	166	166	...	...	579	579	...
Railway materials for Construction...	25,261	35,730	746,693	...	23,694	40,338	5,63,762	...
Railway materials for Revenue ...		736,224				5,47,118		
Minerals—								
For the public	763,754	732,222	...	31,532	48,68,141	44,00,126	...	4,68,015
,, Construction	735	113	...	622	1,319	181	...	1,138
,, Revenue	...	177,725	177,725	...	...	5,34,347	5,34,347	...
Total ...	2,864,648	3,471,109	606,461	...	3,00,95,679	2,96,56,368	...	4,39,311
Percentage of goods traffic to total railway receipts.	...	...	...	...	69·61	67·62	...	...

The following table gives an abstract of the outwards and inwards goods traffic at the Howrah and Calcutta stations:—

Abstract of Goods received at and forwarded from Howrah and Calcutta stations during the year 1879 and 1880.

Names of articles.	Received at Howrah and Calcutta.				Forwarded from Howrah and Calcutta.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Beer, spirits, and wines	137	141	4	...	6,201	3,484	...	2,717
Coal	389,420	388,838	...	582	32	38	6	...
Copper	10	13	3	...	3,644	4,001	357	...
Cotton	40,302	47,190	6,888	...	4,610	4,715	105	...
Ghee and oil	3,706	4,519	813	...	1,786	2,775	989	...
Grains	224,100	245,122	21,022	...	319	579	260	...
Gunny	480	502	22	...	12,751	13,300	549	...
Hides and horns	27,519	28,796	1,277	...	46	57	11	...
Indigo	2,687	4,684	1,997	...	4	14	10	...
Iron	306	1,041	735	...	21,584	24,164	2,580	...
Lacdye	3,852	4,481	629	...	262	28	...	234
Lime	8,172	9,537	1,365	...	94	132	38	...
Opium	4,105	7,712	3,607	...	14	4	10	...
Piece-goods	311	339	28	...	45,066	49,155	4,089	...
Salt	28	10	...	18	86,464	92,563	6,099	...
Saltpetre	25,612	20,349	...	5,263	15	51	36	...
Seeds	165,209	198,580	33,371	...	704	1,613	909	...
Stones	2,434	1,494	...	940	59	191	132	...
Sugar	2,098	1,572	...	526	1,154	1,973	819	...
Miscellaneous, including railway materials.	35,557	53,257	17,700	...	94,293	98,245	3,952	...
Total ...	936,045	1,018,177	82,132	...	279,100	297,082	17,982	...

The following table gives an abstract of the outwards and inwards goods traffic at Jubbulpore station:—

Abstract of Goods received at and forwarded from Jubbulpore station during the years 1879 and 1880.

Names of articles.	Received at Jubbulpore.				Forwarded from Jubbulpore.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Beer, spirits, and wines	446	213	...	233	2	...	...	2
Coal	16,087	9,180	...	6,907	...	...	...	...
Cotton	154	214	60	...	41	469	428	...
Grains	5,998		...	5,209	42	454	412	...
Lacdye	136	53	83	...	599	480	...	119
Piece-goods	267	274	7	...	42	79	37	...
Salt	13	127	114	...	1,529	235	...	1,294
Seeds	434	166	...	268	12	75	63	...
Sugar and jagri	4,116	2,808	...	1,308	37	35	...	2
Miscellaneous, including railway materials.	5,365	895	...	470	1,190	1,473	283	...
Total ...		18,728	...	14,288	3,494	3,300	...	194

Working Expenses.—The gross revenue expenditure was less than that in 1879 by Rs. 44,594, or 0·31 per cent.

Abstract of Working Expenses during the years 1879 and 1880.

Head of charges.	Expenses.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Rs.	Rs.	Rs.	Rs.
Maintenance	43,43,357	44,08,053	64,696	...
Locomotive	35,91,423	34,83,169	...	1,08,254
Carriage and Wagon	13,22,707	15,27,989	2,05,282	...
Traffic	26,22,331	25,88,624	...	33,707
General charges	15,30,494	17,06,137	1,75,643	...
Steam-boat	32,231	37,040	4,809	...
Special and miscellaneous	7,92,749	4,39,686	...	3,53,063
Total ...	1,42,35,292	1,41,90,698	...	44,594

Details of the steamer traffic are given below for the last five years:—

Steamer Traffic.

Years.	Earnings.	Expenses.	Deficit.	Profit.
	Rs.	Rs.	Rs.	Rs.
1876	69,228	55,978	...	13,250
1877	45,550	87,719	42,169	...
1878	41,118	38,924	...	2,194
1879	28,801	32,231	3,430	...
1880	30,687	37,040	6,353	...

The foreign traffic was—

	Mds. of goods.	Rs.	No. of passengers.	Rs.
In 1879	2,06,79,146	1,05,29,219	346,445	13,35,871
„ 1880	1,92,93,942	96,84,862	468,719	16,97,399
Decrease	13,85,204	8,44,357	...	...
Increase	...	...	12,2274	3,61,528

GUARANTEED RAILWAYS.

PUNJAB AND SIND.

Sind, Punjab and Delhi Railway.

The following is taken from the Administration Report of the Sind, Punjab and Delhi Railway for the year 1880-81:—

The length of line remained as before, *viz.*—

	Miles.
Ghaziabad to Sher Shah Ghat on the Chenab ...	554
Kotri to Karachi	110
Total	664

The total capital expenditure to the end of the year was Rs. 11,05,85,552, being an average of Rs. 1,66,670 per mile.

Maintenance.

The line was adequately maintained during the year, and no interruptions or serious damage occurred through floods. The very large increase to the waterways in the Beyne and Beas alleys, lately completed at a heavy cost, has, it is hoped, secured that portion of the line from the disasters of previous years; but the floods of 1879 and 1880 showed that the increases given were not too excessive.

The large bridges over the Sutlej, Beas, and Jumna were maintained intact, and the effect of the training groynes on the Sutlej was beneficial in straightening the course of the river and directing it more fairly on to the bridge. It is proposed to persevere with these temporary measures until experience has been gained sufficient to warrant the construction of permanent groynes.

The permanent-way of the line was kept in good order; but the rapid deterioration of the special kind of rail originally laid down on the Amritsar-Ghaziabad Section has necessitated a very considerable replacement of the damaged iron steel-topped rails by those of solid steel throughout.

Stations.—Four new temporary stations were opened, making 21 altogether which have been added during the last four years. The whole of these may be said to have already justified their existence; four have already been replaced by permanent stations of an improved pattern, and the others will gradually be similarly treated.

Waiting sheds for 3rd class passengers and sheds for sheltering outwards goods have now been supplied to all the chief stations on the line, to the manifest convenience of travellers and traders.

Of the older stations, the additions and alterations at Lahore which have been going on for some time past are now practically completed, and have made this large and important station one of the most convenient in Upper India.

A new station is in course of erection at Mooltan city; and a large and convenient station at Kurrachee city has been sanctioned, which will take the place of the unsightly temporary building that has so long done duty as such.

The important Amritsar station is also to be rearranged and enlarged, in order to accommodate the rapidly increasing goods traffic.

Several blocks of additional staff quarters have been completed at Lahore and Mooltan and several others sanctioned for Saharanpur, in order to accommodate the increased staff required for the growing traffic.

Locomotive.

Five additional powerful engines have been ordered from England.

The goods stock has been increased by about 600 covered wagons capable of carrying 10 tons each. The old 6-ton wagons are gradually being converted so as to carry 8 to 10 tons each.

A considerable number of old-fashioned passenger carriages have been converted into more convenient classes of vehicles; 13 third class carriages of an improved pattern, holding 80 passengers each, have been added, and 100 additional carriages have been asked for, and will gradually be built. They are all very much required.

Extensive additions to the Lahore workshops are in progress to meet the great increase of work, but others are still needed to the carriage factory. Minor additions have also been made at Kurrachee.

The locomotive train work has been satisfactorily performed on the Punjab and Delhi sections, but much trouble has been experienced on the Sind Section, from the bad quality of the water.

Traffic.

The very heavy traffic caused by the Afghan war, in troops, animals, stores, &c., was satisfactorily carried without accident, and the thanks of Government were conveyed to all concerned, with the grant of a month's pay as bonus to the employés of the Locomotive and Traffic Departments. A separate report has been recently submitted on this war traffic, which is therefore here only briefly referred to. The chief strain during the year was felt after the disaster of Maiwand in August last, which caused a heavy rush on to the line, and the return of the troops from Southern Afghanistan at the conclusion of the war, for which special arrangements were made, at the Viceroy's desire, to make the journey during the hot season as little trying as possible.

The normal traffic of the line also showed a healthy increase, especially in regard to the remunerative passenger traffic, caused partly by the development of traffic on the newly-opened State lines, and partly by the increased facilities afforded to the travelling public in the shape of additional stations, convenient local trains, and provision of adequate shelter.

Experience has so fully proved that every additional facility afforded to traffic is as rapidly followed by increased traffic, that it is hoped the Company will steadily pursue the policy of the last four years, for it is still believed that much remains to be done in attracting traffic by lower rates and other inducements, more especially during the periods of normal depression.

The following figures give the results of the working of the line for the last two years:—

Year.	Number of passengers.	Passenger receipts.	Goods receipts.
		Rs.	Rs.
1879-80	3,624,000	39,60,000	74,71,000
1880-81	4,413,000	42,96,000	75,50,000

The receipts of both years were considerably affected by the Afghan war, and those of the former year by an extra large Hardwar fair.

The total receipts, working expenses, and net profits for the two years were as under, deducting the Flotilla:—

Year.	Gross receipts.	Working expenses.	Net profits.
	Rs.	Rs.	Rs.
1879-80	1,14,30,000	63,72,000	50,58,000
1880-81	1,18,46,000	63,56,000	54,90,000

The net profits of last year amounted to nearly 4·8 per cent. on the capital.

It should be recollected that the working cost of this line is necessarily high on account of the great expenses of fuel, which has to be brought from Bengal, and is priced at Lahore at Rs. 35 per ton.

The Indus Steam Flotilla having done its work in completing the communication with the port of Karachi, pending the completion of the railway, its operations, which had considerably slackened on the opening of the Indus Valley Railway, were entirely suspended at the end of the year under review, and the vessels are now laid up and awaiting purchasers.

NORTH-WESTERN PROVINCES AND OUDH.

Oudh and Rohilkhand Railway.

The following information is extracted from the Administration and Progress Report of the Oudh and Rohilkhand Railway for the year 1880-81:—

I.—LENGTH OF LINE OPEN AND UNDER CONSTRUCTION.

No change in the open mileage of the line occurred during the year, the total length open at the beginning and end of the year being—

MAIN LINE.

	Miles.
Moradabad to Rajghat	419·20
BRANCHES.	
Alighar, Cawnpore, and Bahramghat Branches ...	127·65
Grand Total ...	546·85

The only extension in progress was that in connection with the proposed bridge over the Ganges at Rajghat, which is about 5 miles in length.

II.—REVIEW OF PRINCIPAL OPERATIONS OF THE YEAR.

i.—ENGINEERING.

1.—*Benares Bridge and Approaches.*

In April 1880, the Chief Engineer of the Company was deputed to discuss with the Company's Consulting Engineer in England the details of the design of this bridge. He

resumed charge of his office in India on 26th November 1880, and before leaving England reported to the Managing Director of the Company that the main features of the bridge had been settled.

In January 1881, however, information was received of a reduction in the length of the main spans from 416 to 356 feet, which necessitated a reduction in the sizes of the girders in the approach on the right bank, it being intended to use these girders, in sets of 3, as a platform on which to erect some of the main spans.

The bridge, as now designed, is to consist of 7 spans with a length of 356 feet from centre to centre of piers, the railway and road being carried on the lower boom, and 9 spans of 114 feet each, measured from centre to centre of piers, the railway and road being carried on the upper boom.

The bridge will be straight throughout, and will give a clear headway for boats of 25 feet when the flood-level is 245 above the G. T. S. datum, this being the highest flood yet recorded.

The details of the girders had not been completely worked out by the end of the year, but the designs were in a forward state, and tenders will probably be shortly called for.

In the more pressing matter of plant for the execution of work on the piers, considerable progress was made during the year. By the end of May 1881, the caissons, pontoons, timber-staging, excavators, and steam cranes for working them, were nearly complete and ready for shipment.

The workshop machinery ordered in connection with the bridge is being manufactured, but none had been shipped during the year.

In July 1880, a contract for 30 millions of bricks for the bridge and approaches was let, and was well in hand by the 31st March 1881; but the progress made fell far short of what was contracted for.

The earthwork on the approaches to the bridge was commenced on the 12th June 1880, and considerable progress made by the end of the year. Delay in some places was occasioned by the non-delivery to the Company of the required land, and at the date of writing this report some has still to be made over. The Collector has been frequently urged to expedite the transfer. The delay is attributable to the appeals made by the owners against the compensation awarded, involving reference to the Courts.

2.—*Flood Breaches and Repairs.*

The year under review is one in which very serious injury was done to the line by flood sin the valleys of Ramganga and Gungan, and in the Ganges valley on the Alighar branch.

The floods occurred in the latter half of September 1880, and were caused by the general heavy rain, one result of which was the fatal landslip at Naini Tal.

Level of 1880	538·40
Level of 1879	536·54
	1·86

At the site of the railway bridge the Ramganga reached a level even higher than that of 1879, which caused so much damage, as noted in the last Administration Report.

The main bridge was uninjured, but the spur bund taken off from the right abutment perpendicular to the line was breached. This bund had not been fully protected with block kunkur when the flood came down; but even though breached, it answered the purpose for which it was designed. It was agreed to repair and complete it.

The marginal embankment between the bridge and Bareilly was breached in many places, and it was determined to raise it to three feet above flood-level.

On the left bank of the Ramganga a gap of 156 feet in length was made, and holes were scoured out below two bridges. It was ultimately decided not to increase the waterway here, but to give additional block kunkur protection.

3 of 10′ at chainage 1933.
3 of 56′ [Dejorah] 1438.

On the approach to the right bank of the Ramganga, eight gaps, aggregating nearly 8,000 feet, were made in the embankment, and six bridges were more or less injured.

Chainage	1863	... ...	from 6 of 15′	to 16 of 15′
,,	1768	[Harinphunda] ...	,, 4 of 30′	,, 10 of 30′
,,	1877	[Jellalganj] ...	,, 3 of 20′	,, 8 of 20′

In this length it was decided to raise a good deal of the bank and to increase the water in three cases.

The Gungan valley suffered not only from the floods caused by heavy rainfall in the upper part of the course of that river, but by the addition of spill from the Ramganga.

Chainage	1637	[Kerula Bridge] ...	from 3 of 30′	to 5 of 30′
,,	1660	... ...	.....	3 of 30′
,,	1686	... ...	,, 1 of 10′	,, 4 of 10′
,,	1712	... ...	,, 1 of 10′	,, 4 of 10′
,,	1745	... ...	,, 1 of 10′	,, 8 of 10′
,,	1789	... ...	,, 1 of 10′	,, 3 of 10′

It was proposed to increase the waterway here, as shown in the margin, and also to raise the embankment in certain places.

All the repairs and new works above named were well in hand by the end of March 1881, and all diversions were removed before the commencement of the rains.

But in the Ganges valley also, on the Aligarh branch, considerable damage was done at the same time.

Five bridges on this length were injured in various ways, one of three spans of 30 feet being completely washed away, and some 12,000 feet of the bank was breached.

After considerable discussion, it has been determined to retain only the original waterway on this length, and the requisite repairs and renewals were well advanced by the end of the year.

3.—*Miscellaneous Capital Works.*

The new works undertaken, in addition to those necessitated by the floods, were all of a petty nature. They consisted chiefly of goods lie-byes and open goods sheds formed principally of old rails.

At Aligarh 12 units of quarters were begun.

4.—*Maintenance.*

The Consulting Engineer, on his inspection in February and March 1881, was not satisfied with the condition of the permanent-way generally; and the Chief Engineer admitted that in some parts it was not up to its usual standard, advancing as a reason for this the abnormally heavy work entailed on the staff by the flood damages referred to above. In other respects the line has been properly maintained, and this portion of the work calls for no further present remark.

ii.—Locomotive Shops.

1.—*Rolling Stock of Company.*

The following table shows the number of engines and vehicles of various kinds on hand on 1st April 1880 and 1st April 1881:—

	Stock in hand on		Increase during 1880-81.	Under construction on 31st March 1880-81.
	1st April 1880.	1st April 1881.		
Locomotives—				
Mixed engines	...	24	24	6
Goods „	90	90	...	...
Total Locomotives ...	90	114	24	6
Coaching Stock—				
Upper class	34	36	2	...
Lower „	206	206	...	...
Composites	4	2	2	...
Officers' carriages	4	4	...	...
Horse boxes	27	27	...	...
Brake vans	57	57	...	...
Total Coaching Stock ...	332	332	...	...
Goods Stock—				
Covered goods wagons	2,150	2,705	555	21
Ammunition wagons	4	4	...	...
Timber trucks	157	157	...	...
High-sided trucks	72	72	...	...
Cattle trucks	6	6	...	...
Total Goods Stock ...	2,389	2,944	555	21
Maintenance—				
Low-sided	121	121	...	...

The composite carriages are generally being converted into upper class, and four lower class carriages have been altered for use as postal vans.

Thirty new engines of a heavier type than the old ones have been received during the year, and all but six were on the line on the 31st March 1881. These six had been

running, but were taken again into the shop to be painted. The Locomotive Superintendent reports with regard to these that, though there has not been time to judge fairly of their merits, the returns, so far, show a serious increase in the consumption of fuel for vehicle hauled as compared with the engines before on the line.

2.—Stock built for State Railways.

The following stock was erected during the year for State Railways:—

	Rajputana Railway.	Cawnpore and Farukhabad Railway.	Total.	Stock in hand on 31st March 1881.	
				Rajputana Railway.	Cawnpore and Farukhabad Railway.
1st class	.....	.....	.....	6	10
Composites	.....	.....	.....	3	.....
3rd class	30	37	67	.....	39
Horse boxes	6	.....	6	.....	.....
Brake and Post Office vans ...	.....	7	7	.....	3
Iron covered goods wagons ...	.....	150	150	.....	.....
Low-sided wagons	.....	50	50	.....	10
Timber trucks	.....	10	10	.....	.....
Total ...	36	254	290	9	62

iii.—Working.

The total train mileage during the year is less than that of 1879-80, which in its turn showed a considerable falling off from that of previous years.

The figures are—

1877-78	1,332,502
1878-79	1,395,504
1879-80	1,243,789
1880-81	1,237,358

The net results of working are, however, not by any means so unfavorable, as shown in the following table:—

Mean mileage open, 546·85.	1880-81.	1879-80.	1878-79.	1877-78.
	Rs.	Rs.	Rs.	Rs.
Traffic earnings	45,64,674	39,88,644	49,36,846	43,70,132
Working expenses	25,25,450	24,91,070	25,73,601	23,80,216
Net profits	20,39,224	14,97,574	23,63,245	19,89,916
Receipts per mile open per week	160	140	174	153

The total traffic receipts were greater than those of the previous year, and the increase occurs both in passenger and goods traffic. The receipts from passengers are in excess of those of any of the three previous years, but the goods receipts fall short of those of 1877-78 and 1878-79, as shown below:—

	1880-81.		1879-80.		1878-79.		1877-78.	
	Number or weight.	Earnings.	Number or weight.	Earnings.	Number or weight.	Earnings.	Number or weight.	Earnings.
	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.
Upper class passengers ...	21,649½	77,348	19,463	68,104	20,363	76,541	18,492	68,085
Lower ditto ...	2,492,033½	17,69,680	2,669,056	15,56,785	2,663,324	15,60,316	2,490,375	13,80,339
Luggage, parcels, horses, &c. ...	...	1,34,655	...	1,19,517	...	1,71,574	...	1,10,683
Total Coaching ...	...	19,81,683	...	17,44,406	...	18,08,431	...	15,59,108
	Tons.		Tons.		Tons.		Tons.	
Public goods	527,388	21,89,852	460,553	18,26,715	604,842	26,66,553	628,726	23,44,822
Railway materials	103,133	71,825	24,505	23,778	57,115	24,602	81,025	50,018
Telegraph	...	1,963	...	10,306	...	12,015	...	12,891
Sundries	...	3,09,351	...	3,83,439	...	4,25,245	...	4,03,293
Total Goods ...	...	25,82,991	...	22,44,238	...	31,28,415	...	28,11,024
Grand Total ...	...	45,64,674	...	39,88,644	...	49,36,846	...	43,70,132

As regards passengers, this excess is in spite of the fact that the number of lower class passengers carried is less than in 1878-79 and 1879-80, and only very slightly in excess of 1877-78, and is attributable to the raising of the lower class fare in January 1880 from 2 pies to 2½ pies per mile.

The Agent attributes the falling off in numbers to the general depression of trade, and to the fact that traffic was stopped over some sections from 20th September to 20th October 1880, in consequence of breaches caused by the floods. But the former remark applies with full force to the greater part of the year 1879-80, in which year also, in September 1879, and again in February 1880, traffic was interrupted by floods; and it is impossible to resist the conclusion that some of the falling off in numbers is to be attributed to the raising of the rate.

It should be noted, too, in this connection, that the number of passengers in September and October 1880, taken together, exceeds the number in the same month of 1879.

Although the immediate financial result to the line may be good, a reduction in numbers travelling during the year is not a good augury for the future.

The goods receipts, whilst better than those of 1879-80, are less than those of the two previous years.

The table below gives the working expenses for four years:—

	1880-81.	1879-80.	1878-79.	1877-78.
Total train miles	1,237,358	1,243,789	1,395,504	1,332,502
	Rs.	Rs.	Rs.	Rs.
Maintenance	6,06,459	5,15,716	4,43,017	4,92,234
Locomotive expenses	7,33,291	7,86,504	9,25,002	7,95,429
Carriage and Wagon expenses	2,41,183	2,44,883	2,95,362	2,04,272
Traffic expenses	5,24,057	5,28,292	5,08,862	4,88,565
General charges	3,82,813	3,68,121	3,60,802	3,19,177
Special and miscellaneous expenditure	37,647	47,554	40,556	80,539
Total ...	25,25,450	24,91,070	25,73,601	23,80,216
Percentage of working expenses to receipts ...	55·33	62·45	52·13	54·47

42. The cost of the same per train mile is as follows:—

	1880-81.	1879-80.	1878-79.	1877-78.
Mean mileage open	546·85	546·85	545·17	547·7
Mean maintained by Revenue	546·85	545·00	543·70	547·7
	Rs.	Rs.	Rs.	Rs.
Monthly cost of maintenance per mile	92	79	68	75
	As.	As.	As.	As.
Maintenance per train mile	7·84	6·63	5·08	5·91
Locomotive expenses per train mile	9·48	10·12	10·61	9·55
Carriage and Wagon expenses per mile	3·12	3·15	3·38	2·45
Traffic expenses „	6·78	6·79	5·84	5·87
General charges „	4·95	4·74	4·14	3·83
Special and miscellaneous expenditure per mile ...	·48	·61	·46	·96
Total per train mile ...	32·65	32·04	29·51	28·57

and the general results may be summarised as follows:—

	1880-81.	1879-80.	1878-79.	1877-78.
Train mileage	1,237,358	1,243,789	1,395,504	1,332,502
Gross earnings per train mile	Rs. 3·69	Rs. 3·20	Rs. 3·53	Rs. 3·28
Expenses ditto	„ 2·04	„ 2·00	„ 1·84	„ 1·79
Profits ditto	„ 1·65	„ 1·20	„ 1·69	„ 1·49
Percentage of expenses on earnings	„ 55·33	„ 62·45	„ 52·13	„ 54·47
Ditto of profits on total capital expended ...	„ 3·36	„ 2·56	„ 4·14	„ 3·51
Ditto ditto on cost of open line ...	„ 3·38	„ 2·57	„ 4·16	„ 3·53
Receipts per mile open per week	„ 1·60	„ 1·40	„ 1·74	„ 1·53
Weight of fuel consumed per train mile	lbs. 128*	lbs. 130	lbs. 136	lbs. 129
Average gross load moved per train mile (approximate)	Tons 281	Tons 266	Tons 254	Tons 241

* Weight calculated in the denomination of wood.

BENGAL.

Eastern Bengal Railway.

The following extracts are taken from the Progress and Administration Report of the Eastern Bengal Railway for the year 1880-81:—

The length of this line on which rates and fares are charged is 158·75 miles of single road. The total length, including sidings, is 200·61 miles. The total capital expenditure up to the end of the year was Rs. 3,31,68,513, excluding steam-boat expenditure, Rs. 14,16,796, which gives an expenditure per mile of Rs. 2,08,935 upon the running or train length (158·75 miles) and of Rs. 1,65,338 upon the total length of the line (200·61 miles).

During the year—

	Rs.
The capital expenditure, including steam-boat expenses, amounted to	3,00,956
„ credits to capital	2,455
Balance to capital expenditure ...	2,98,501

Construction works.—The special works sanctioned after last year's experience for protecting the line against high flood on the main rivers have nearly all been completed. The floods on the Ganges and Brahmaputra were not so high this year, and no serious damage has been caused.

The erosion at Goalundo, however, continues. A bight has been formed between miles 148 and 150, where the Ganges has cut 430 yards into the promontory; but the river is still some 700 yards from the line, and at the close of the year the stream was well away from the promontory.

The rails between Aranghatta and Bogoola, where the line was inundated, have been raised 2 feet, as also at Belgachi for a length of 2 miles. The drainage cuts at Aranghatta and mile 56 have been completed, and the culverts and bridges near Bogoola have been repaired and protected with stone.

The Government of Bengal has also sanctioned the restoration of certain embankments along the Bhagiruthee river, which, it is hoped, will diminish the spill of the flood towards Bogoola.

Maintenance.—The relaying of the line between Sealdah and Barrackpore with steel rails was commenced this year, but has, owing to the want of materials, progressed very slowly. A length of only 13,266 feet has been thus laid.

The inverting of the rails on the Goalundo extension was also commenced this year, and about 8 miles have been completed. The road here runs very smoothly.

The cost of maintenance—

	1879.	1880.
Per mile per month was, Rs.	190-10-7	201-11-7
Number of wooden sleepers renewed ...	20,515	21,150
Number of cast-iron bowls (single) renewed ...	542	252
Lineal feet of rails renewed	15,949	16,891
„ „ „ inverted	43,726	52,620
Cubic feet of ballast expended	265,823	337,807

The Damukdea Branch of the Northern Bengal State Railway was maintained by the Company in good order during the year.

Locomotive Department.—The five locomotive engines last received, which were in course of construction last year, have been completed and kept in reserve.

The locomotive stock and workshop machinery have been maintained in good order.

The average daily engine and train mileage run by the engines was—

	Engine miles.	Train miles.
In 1879	51·80	55·00
„ 1880	62·11	59·95
Increase ...	10·31	4·95

The consumption of coal in pounds per train mile was—

	lbs.
In 1879	53·93
„ 1880	48·83
Decrease	5·10

Carriage and Wagon Department.—The whole of the rolling-stock has been maintained in good order.

During the year—
- 16 vehicles have been constructed and turned out.
- 65 have been rebuilt and turned out.
- 97 heavily repaired and turned out.
- 1,628 slightly repaired and turned out.

At the end of the year there was under construction—
- 1 fish-van.

There were besides—
- 41 vehicles rebuilding.
- 18 vehicles under heavy repairs.
- 27 vehicles under slight repairs.

Steam-boat Department.—The steamer *Princess Alice* had her engines compounded and supplied with new boilers. The improvement to her engines and new boilers have given very satisfactory results. She now saves 9 cwt. of coal per hour. Her engine-room crew has been reduced by 10 men. She has 1,500 maunds more carrying space, and her speed and towing power have considerably increased.

The despatch steamers *Lukhia* and *Soorma*, for which the ironwork and machinery were received during the year, have been put together. The former was launched on the 21st September, and the latter on the 20th October.

The engines of the *Prince Alfred* and the boiler of the *Rob Roy* were under repairs at the close of the year, and the engines of the *Prince of Wales* were about to be taken in hand.

Flats Nos. 2 and 7 were docked and repaired at Calcutta, and several other flats had slight repairs done to them during the year.

Accidents.—There were no accidents of a serious nature during the year.

Earnings and Expenditure.—Exclusive of the Flotilla—

	Rs.
The total earnings amounted to	44,51,318
„ expenditure „	19,07,547
Balance net earnings ...	25,43,771

Details are given in the following table :—

Abstract of Earnings, Expenses, and Profits.

Year.	Miles open.	Train miles (Traffic Department.)	Earnings.	Expenses.	Profits.	Per mile open.			Per train mile.			Percentage of working expenses on earnings.	Percentage of profits on capital expended.	Capital on which guarantee is paid, or total capital paid up.	Rate per cent. of profits on total capital paid up.
						Earnings.	Expenses.	Profits.	Earnings.	Expenses.	Profits.				
			Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs. A. P.	Rs. A. P.	Rs. A. P.			Rs.	
1876	158·50	551,244	33,01,377	14,41,286	18,60,091	20,862	9,108	11,754	5 15 10	2 9 10	3 6 0	43·7	5·9	3,37,37,040	5·8
1877	158·89*	656,704	43,56,003	17,17,557	26,38,446	27,415	10,809	16,606	6 10 1	2 9 10	4 0 3	39·4	8·6	3,37,37,040	8·4
1878	171·75*	626,518	42,16,988	17,48,488	24,68,500	24,553	10,180	14,373	6 11 8	2 12 8	3 15 0	41·5	7·6	3,37,37,040	7·8
1879	171·75*	669,517	40,65,814	17,80,403	22,85,411	23,673	10,366	13,307	6 1 2	2 10 7	3 6 7	43·8	7·1	3,53,98,364	6·9
1880	171·75*	675,337*	44,51,318	19,07,547	25,43,771	25,917	11,106	14,811	6 9 5	2 13 2	3 12 3	42·9	7·7	3,53,98,364	7·7

* This includes the Damukdea Branch.

The earnings from—

				Rs.
Coaching traffic amounted to	...	...	...	14,88,015
Goods traffic	...	...	...	28,73,264
The percentage on the earnings	...	...	...	44,51,318
Of passenger traffic is	...	...	...	33·40
Of goods traffic is	...	...	...	64·55

Details are given in the following tables:—

Details of Passenger Traffic.

Description of classes.	Number conveyed.						Receipts.					
	1879.	1880.	Increase in 1880.	Decrease in 1880.	Increase per cent.	Decrease per cent.	1879.	1880.	Increase in 1880.	Decrease in 1880.	Increase per cent.	Decrease per cent.
							Rs.	Rs.				
1st class	25,080	26,593	1,513	...	6·03	...	50,096	49,080	...	1,016	...	2·03
Percentage of total passenger traffic	1·23	1·26	...	...	...	...	4·06	3·96	...	...	...	...
2nd class	47,093	55,355	8,262	...	17·54	...	43,604	46,322	2,718	...	6·23	...
Percentage of total passenger traffic..	2·31	2·61	...	...	...	...	3·53	3·74	...	...	...	...
3rd class	495,766	487,512	...	8,254	...	1·66	3,49,519	3,24,247	...	25,272	...	7·23
Percentage of total passenger traffic..	24·31	23·03	...	...	...	...	28·31	26·16	...	...	...	...
4th class	1,471,418	1,547,155	76,037	...	5·17	...	7,91,451	8,19,712	28,261	...	3·57	...
Percentage of total passenger traffic..	72·15	73·10	...	...	...	...	64·10	66·14	...	...	...	...
Total ...	2,039,057	2,116,615	77,558	...	3·80	...	12,34,670	12,39,361	4,691	...	0·38	...
Percentage of passenger traffic to total railway receipts	...	...	...	...	...	...	30·41	27·88	...	...	...	...

Details of Goods Traffic.

Description of goods.	Weight carried.				Receipts.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.	1879.	1880.	Increase in 1880.	Decrease in 1880.
Merchandise—	Tons.	Tons.	Tons.	Tons.	Rs.	Rs.	Rs.	Rs.
For the public ...	340,398	391,055	50,657	...	24,50,978	27,78,201	3,27,223	...
Military stores ...	901	1,850	949	...	9,070	20,298	11,228	...
Railway materials ...	1,371	4,360	2,989	...	1,350	4,852	3,502	...
Minerals—								
For the public ...	10,959	16,908	5,949	...	34,944	52,693	17,749	...
„ Construction ...	...	...	...	...	...	...	...	...
Live-stock ...	...	...	...	...	564	1,012	448	...
Rent demurrage, &c. ...	...	...	...	...	9,692	15,535	5,843	...
Miscellaneous ...	...	...	...	...	3,845	672	...	3,173
Total ...	353,629	414,173	60,544	...	25,10,443	28,73,263	3,62,820	...
Percentage of goods traffic to total railway receipts.	...	...	...	...	61·80	64·64	...	...

The following table gives an abstract of the inwards and outwards goods traffic at Sealdah and Chitpore stations :—

Abstract of Goods received at and forwarded from Sealdah and Chitpore stations during the years 1879 and 1880.

Names of articles.	Received at Sealdah and Chitpore stations.				Forwarded from Sealdah and Chitpore stations.			
	1879.	1880.	Increase in 1880.	Decrease in 1880.	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Beer, spirits, and wines ...	15	8	...	7	890	360	...	530
Brass wire	157	205	48	...	1,452	218	...	1,234
Chillies	58	222	164	...	46	12	...	34
Coal	963	17	...	946	9,377	8,565	...	812
Cotton	719	1,086	367	...	226	242	16	...
Dhall, grain, and pulses ...	7,046	5,939	...	1,107	4,095	486	...	3,609
Flour	...	...	...	...	465	95	...	370
Ghee	1	2	1	...	139	157	18	...
Gunny-bags	4,653	4,117	...	536	573	439	...	134
Hides	5,645	5,673	28	...	126	9	...	117
Indigo	310	374	64	...	43	5	...	38
Indigo seeds...	15	41	26	...	343	247	...	96
Jute	142,240	115,402	...	26,838	205	167	...	38
Linseed	6,497	5,581	...	916	71	2	...	69
Mustard seed	1,305	5,964	4,659	...	676	116	...	560
Piece-goods	67	57	...	10	12,407	6,812	...	5,595
Rice	10,250	5,519	...	4,731	7,413	676	...	6,737
Salt	8	...	...	8	30,428	8,465	...	21,963
Seeds not otherwise classified ...	1,441	975	...	466	311	198	...	113
Sugar	5,640	6,558	918	...	1,466	575	...	891
Tea	3,989	3,551	...	438	29	42	13	...
Tobacco	6,970	9,422	2,452	...	302	38	...	264
Turmeric	2,723	454	...	2,269	33	6	...	27
Miscellaneous, including railway materials.	5,823	6,307	484	...	23,097	19,577	...	3,520
Total ...	206,535	177,474	...	29,061	94,213	47,509	...	46,704

Working Expenses.—The gross revenue expenditure was more than that of 1879 by Rs. 1,41,456, or 6·83 per cent :—

Abstract of Working Expenses for the years 1879 and 1880.

Heads of charges,	Expenses,			
	1879.	1880.	Increase in 1880.	Decrease in 1880.
	Rs.	Rs.	Rs.	Rs.
Maintenance	3,63,218	3,96,386	33,168	...
Locomotive	4,27,746	4,34,923	7,177	...
Carriage and Wagon	1,97,785	2,14,286	16,501	...
Traffic	4,59,768	5,04,850	45,082	...
General charges	3,03,294	3,01,388	...	1,906
Steam-boat	2,89,992	3,04,304	14,312	...
Special and miscellaneous	28,592	55,714	27,122	...
Total ...	20,70,395	22,11,851	1,41,456	...

Details of the Flotilla traffic are given below for the last five years :—

Steamer Traffic.

Years.	Earnings.	Expenses.	Deficits.	Profits.
	Rs.	Rs.	Rs.	Rs.
1876	3,38,570	2,40,366	...	98,204
1877	4,71,031	2,64,955	...	2,06,076
1878	4,28,833	2,82,261	...	1,46,572
1879	4,38,113	2,89,992	...	1,48,121
1880	4,84,843	3,04,304	...	1,80,935

BOMBAY.

Great Indian Peninsula Railway.

The following is extracted from the Progress and Administration Report of the Great Indian Peninsula Railway for 1880-81 :—

Works in progress on Capital account.—The principal works carried on during the year on Capital account were—

Bori Bandar terminal station and offices.—The progress was small, owing to difficulties with the petty contractors for cut-stone work. Some fresh arrengements will have to be made to ensure quicker work in future, as the petty contract system does not appear to have answered in this case.

The extension of Parel shops referred to in last year's report was completed. Some extra sidings were sanctioned during the year.

Quadrupling line.—This work can only be completed when the new Byculla station and overbridge have been constructed, and the Bombay, Baroda and Central India Railway Company have been furnished with a new goods station south of Carnac bridge—works which there is reason to believe will soon be taken in hand.

Clearing slopes of Bhor Ghat.—Nearly all the cutting will be completed this season. It will then remain to decide on the extent to which it is necessary to provide retaining walls at the toe of the slope, and to build them where required.

Addition of an eighth sleeper to 24' rails.—Of the 568 miles of line (190 miles being double) on which this addition was sanctioned in 1874, there still remain 24 miles (single line) to complete.

Saxby and Farmer's interlocking apparatus for single line stations fixed at stations between Lonavla and Poona gives great satisfaction. The first cost is considerable, but it gives complete safety. The question whether this or a less expensive system should be introduced at other single line stations through which the mail trains run without stopping is under consideration.

Junction works at Nagpur station were completed, with the exception of the weighbridge, the fixing of which has been suspended, pending further consideration as to the site.

The new junction station at Khandwa made considerable progress. It is hoped that both it and the new State Railway line of approach from the north end, which is about to be taken in hand, will be ready for use in 1881-82.

The stores depôt at Parel given to the Great Indian Peninsula Railway Company in exchange for the site of the Byculla locomotive shops and stores has been taken over by the Company, but no application for sanction to complete the warehouse, store sheds, &c., which it is proposed to erect upon it, has yet been received.

The Wadi Bandar goods terminus.—The following were sanctioned :—

Construction of roads and level-crossing in extension of Frere Road.
Removal of the Rohilla shed and its re-erection as a goods shed.
Provision of goods offices.
Construction of merchants' waiting-room.
Construction of latrines.

The final arrangements for Wadi Bandar were very fully discussed, and the permanent boundary of the Company's land has now been decided upon, the area to be occupied by the goods terminus and siding being fixed at 67 acres, and the remainder of the Wadi Bandar estate, measuring about 11 acres, reverting to Government.

The Railway Company will now proceed to provide the additional sheds, roads, and lines required for the proper conduct of the traffic, and will construct a permanent boundary wall.

It is proposed that an overbridge should be constructed across the railway estate on the line of the Frere Road extension to Mazagon at the joint expense of the Railway Company, the Port Trust, and the Municipality, it being considered impossible to maintain the present level-crossing with due regard to safety and convenience.

The introduction of Saxby and Farmer's system of signalling and interlocking apparatus has been arranged for at Dadar Junction, the cost being shared between the Great Indian Peninsula and Bombay, Baroda and Central India Railway Companies.

An extension of sidings was sanctioned at Bhusawal Junction, interlocking apparatus being provided. The increased accommodation was much needed, and the addition will much facilitate working and prevent the recurrence of a block such as occurred during the last famine season.

Byculla new station and overbridge.—At a meeting held on 23rd March it was proposed—

(1) To build a new passenger station for Byculla at the hay and wood siding site, as proposed by the Bombay Government and the Railway Company in 1878.

(2) To convert the present Byculla station into staff quarters and utilise the platform roofing elsewhere.

(3) To shift the points connecting with the engine-shed a little further to the southward of the Nesbit Lane crossing.

(4) To rebuild the Byculla bridge for four lines of rails as soon as the new station is finished.

It was also proposed to divert a large proportion of the traffic using the Nesbit Lane crossing to the Hancock bridge by a new road skirting the Great Indian Peninsula Railway on the west, and to build a foot-bridge at the level-crossing.

The Government of India, in sanctioning the expenditure of Rs. 50,000 for land for the new Byculla station, have suggested the early removal of the Byculla running shed to Parel.

Estimates for the new works required are being prepared and will be submitted for sanction, and the question of removing the running shed is receiving attention.

Among *minor works sanctioned* may be mentioned the following :—

Cross-over road and signalling cabin at Ghat Cooper.

Additions and alterations at Kasara, Igatpuri, and Devlali.

Construction and improvement of wells at Jubbulpore, Jeur, Gudur, Kulburga, and Nulwar.

Works for the completion of Dhond Junction station.

Strengthening girders at the Kali Marchan.

Foot-bridge at Manmad and under-bridge at Bhusawal.

Signallers' quarters at 15 stations.

The reconstruction schedules exhibiting the works which under an arrangement come to between Government and the Great Indian Peninsula Railway Company in 1866 were to be rebuilt when necessary from capital funds or at the cost of the Casualty Fund were reconsidered ; and an arrangement proposed by the Company's Consulting Engineer and the Consulting Engineer to the Bombay Government after personal discussion was, with slight modification, agreed to by Government and the Home Board, under which a payment has been made from the Casualty Fund to capital of the accumulated balance in excess of Rs. 7,00,000, and the reconstruction of certain works entered in the finally revised schedule is to be charged to capital account. When these works are completed, the reconstruction account is to be finally closed, and measures are being taken to carry them out without undue delay. Thirty reconstruction works, estimated at Rs. 16,000, were in hand at the close of the official year.

No additions to engine or rolling stock were sanctioned on capital account during the year. The addition of 500 covered wagons was advocated by the General Traffic Manager in 1879 ; but in view of the fact that the carrying capacity of the stock and facilities for working it over the Great Indian Peninsula Railway have been increased since the pressure of traffic was last felt, and that the amounts of foreign stock available for back loading is increasing and is likely to increase still more under the Conference rules, which tend to ensure its speedy return, it was thought advisable to defer making any further additions.

The large number of wagons returned as constantly under repair on the Great Indian Peninsula Railway attracted notice, and complete explanation of the apparent excess over the number in shops on other railways has not yet been received.

It is obvious that the more quickly the stock is passed over a line, and the smaller the proportion of the stock under repair, the greater is its carrying capacity. Other things being equal, that line will require the fewest wagons which has its stock in the best order and works it with a minimum waste of time in demurrage or on unduly slow speed.

Warora coal.—As stated in the last Administration Report, the Railway Company agreed to take, from 1st April 1880, 50,000 tons annually of this coal at Rs. 5 a ton, free of all royalty and all charges except carriage. Owing, however, to a breakdown in the machinery of the mine the deliveries during the year have amounted to 9,085 tons, or an average of 757 tons a month only.

The Railway Company are now receiving about 2,000 tons a month, and it is understood that an additional shaft has been sunk in the mines and is nearly ready to work, so that a large increase in the delivery of the coal may be shortly expected.

Mohpani coal.—12,787 tons of this coal were received during the year ; but the present output is about 800 tons per month, and larger receipts are not anticipated for the next two years.

The Mohpani Branch was opened for passenger and goods traffic in December 1880.

Agreements for working State lines have, as stated in a former part of the report, been made in the case of the Dhond and Manmad and Berar branch lines.

Ghat working.—The following alterations in the system of ghat working have been sanctioned by Government and the Board of Directors:—

(*a*)—When two engines are used for ascending passenger trains, one is to be placed in the rear, as is at present done for goods trains.

(*b*) *and* (*c*)—The maximum load of ascending passenger trains with two engines, one being applied in rear, to be in future fifteen passenger vehicles, two main line brakes, and four incline brakes; total twenty-one on both ghats.

(*d*) *and* (*e*)—In descending passenger trains with two engines, the maximum load to be fixed at fifteen passenger vehicles, two main line brakes, and four incline brakes; total twenty-one on both ghats, the same as for ascending trains.

(*f*)—The maximum load of ascending goods trains with two engines on both ghats to be twenty-two loaded wagons and three incline brakes; total twenty-five.

(*g*)—For descending goods trains, the load to be twenty-five loaded vehicles and three incline brakes, total twenty-eight; any wagon not provided with a side brake reckoned as two wagons. The knuckle-jointed pin for brakes recently introduced by the Locomotive Superintendent to be applied to all the stock.

(*h*)—With descending goods trains and one engine no alteration is proposed; the load to remain as at present—eighteen loaded vehicles and three brakes.

(*i*)—When fifteen-ton brakes are used, it is proposed to reckon them in the proportion of not less than two fifteen-ton brakes to three ten-ton.

(*l*)—A compound ghat brake to be designed with a view to obviate the objections entertained to running compound brakes of the existing type between Bombay and Poona and Bombay and Igatpuri.

(*a* 1)—The opinion of the General Traffic Manager being opposed to placing the brakes upon ascending goods trains in the middle when worked by two engines, it was decided not to alter the present arrangement.

The consideration of the question whether the incline brakes upon passenger trains be placed in the centre of the train, both on ascending and descending trains when two engines are used, was deferred pending the introduction of improved compound brakes.

(*b* 1)—That sanding by hand be confined to the following:—Before all descending trains by which passengers are carried, the rails to be sanded for a distance of 250 yards ending at the bottom of the gradient at the entrance to the reversing station on the Bhor Ghat, and also for a similar distance above all the catch sidings on both ghats. This recommendation to be adopted for one year, on the expiry of which it is to be determined whether the sanding by hand cannot be discontinued entirely or further modified.

It is understood that, with reference to all foregoing clauses, main line brakes are to be always used to assist trains as well as incline brakes.

Road vans when worked upon passenger trains to be fitted with side brake levers acting upon two wheels; the brakes to be pinned down on all descending trains.

It was also proposed that, as an experiment, the passenger train running between Bombay and Poona to be fitted with a continuous brake, the pattern of brake to be adopted to be left to the decision of the Company's Consulting Engineer, Mr. Berkley, and the Locomotive Superintendent, Mr. Jackson.

The Campoli Branch was reopened for traffic in November. It is the intention to keep it open permanently in future, as the revenue more than covers the expenses, and it is found to be a convenience to traders and the inhabitants of the adjacent villages.

The question of establishing a bandar for salt traffic at Chandni Bandar has been revived by the Customs authorities, and the views of the Railway Company as to the construction of the necessary sidings to Thana station have been invited.

The sidings are estimated to cost Rs. 7,000, and the Agent will submit the estimate for sanction.

Education.—The Home Board have sanctioned a contribution from the fine fund of Rs. 20,000 to the Byculla schools and Rs. 20,000 to the Scottish Orphanage on condition of being allowed to send two children to each in perpetuity without charge.

The Board also intimated their concurrence in a proposal to establish a school at Pachmarhi in conjunction with Government, which might be attended by the children of Railway employés on favorable terms; but no definite proposals have yet been submitted by the Agent.

The schools at Igatpuri and Bhusawal were favorably, and the school at Lonavla unfavorably, reported upon by the Government Inspector.

STORES.

The Great Indian Peninsula Railway Company, in consideration of receiving the State Railway stores depôt, partially completed at Parel, and 1½ lakhs in cash, have transferred to Government the whole of the land buildings formerly occupied by their workshops and stores at Byculla, with the exception of the stores warehouse and adjacent yard, which are also to be made over to Government as soon as the Company have erected a new warehouse on the Parel side.

It is proposed to occupy a portion of the land on the Wadi Bandar estate to the east of the Mazagon overbridge and on the north side of the Great Indian Peninsula line as a supplementary State Railway stores depôt.

Arrangements have been made with the Great Indian Peninsula Railway Company for the conveyance of State Railway stores between the Prince's dock and the Byculla depôt at special rates.

Capital.

The following figures afford particulars of the Company's capital account as it stood at the close of 1880:—

		£	Rs.
Capital authorised	... ...	27,595,466	30,10,41,447
Capital subscribed	... ...	23,707,021	25,86,22,042
Capital expended on —			
(*a*) Final Heads	...	£ 22,914,577	
(*b*) Suspense	...	542,567	
		23,457,144	25,58,96,113
Balance available of—			
Capital authorised	... ...	4,138,322	4,51,45,334
Capital subscribed	... ...	249,877	27,25,929
Amount expended on way and works	...	19,535,625	21,31,15,912
Amount expended on rolling stock	...	3,378,952	3,68,61,287
Cost of way and works per mile	...	15,313	1,67,051
Cost of rolling stock per mile	...	2,648	28,887

The amount of capital authorised to be raised remained unaltered during the year, but, though there was no fresh issue of capital, the amount subscribed, *i.e.*, paid into treasury, was £74,187 in excess of the amount recorded at the end of 1879. This is the equivalent of the assets of the casualty fund in excess of 7 lakhs of rupees on the 30th June 1880, *viz.*, Rs. 8,09,313-9-4, which was paid into treasury during the year as "capital not bearing interest," in accordance with an arrangement which was arrived at between the Secretary of State and the Board of Directors. Under this arrangement the cost of certain works of reconstruction, which would otherwise have been chargeable to the casualty fund, becomes a charge against capital, and the immediate effect of the transaction is to relieve Government of liability in respect of interest payable on this portion of the fund's assets which was at that time deposited in the treasury and bearing interest.

The expenditure during the year on construction of way, works and rolling stock, including establishments and general charges, was Rs. 13,93,754, and was incurred principally on the following projects :—

Name of work.	Expended during 1880.		
	1st half.	2nd half.	Total.
Engineering Department.	Rs.	Rs.	Rs.
Bori Bandar passenger terminus	36,925	24,043	60,968
Do. general offices	20,357	53,212	73,569
Wari Bandar, sundry works	54,194	9,132	63,326
Parel locomotive works, &c.	61,515	1,55,936	2,17,451
Thull Ghat, improvement of sidings	18,646	20,903	39,549
Additional (8th) sleeper to every 24′ rail	61,040	6,025	67,065
Suki Nala, additional waterway	58,404	15,480	73,884
Bhor Ghat, flattening slopes	61,673	10,648	72,321
New "Hancock" overbridge, Mazagon	.....	73,766	73,766
Nagpur Junction works	18,730	27,642	46,372
Locomotive Department.			
10 additional ghat engines	2,71,078	C. 1,281	2,69,797
100 brake vans	.....	64,355	64,355
Electric Telegraph.			
Filling block signalling instruments	51,068	3,869	54,937
Establishment.			
Salaries of all departments	45,557	38,572	84,129

The expenditure on the "Hancock overbridge at Mazagon," though debited to capital as shown in the above list during the year, represents work actually done during previous periods. Outlay, as incurred, was paid from revenue and held in suspense; but after some correspondence it was settled that part of the expenditure, to the extent of the above sum of Rs. 73,766, was to be recovered from capital. The adjustment was effected in the books for December 1880 and the accounts of the work finally closed. In connection with this work a sum of Rs. 15,072 (in addition to Rs. 11,025 charged direct to maintenance) was, under the same orders, apportioned against the revenue account for the 1st half of 1880, and was deducted from the surplus profits of that period before the latter were divided between Government and the Company.

The balance of stores in stock, as exhibited in the Company's Indian accounts, fell from Rs. 62,35,763 at the beginning of 1880 to Rs. 59,02,910 at its close, the receipts and issues for the year having thus apparently resulted in a net reduction of capital locked up in stores to the extent of Rs. 3,32,853. But it should be explained that the balance of stores at the beginning of the year, as shown above, did not include the value of those in transit on the 31st December 1879, which amounted to Rs. 11,93,143, while the balance at the close of the year included, for the first time, Rs. 4,91,831 on this account. The net reduction in the stock balance, if due allowance is made for these stores, is thus increased to Rs. 15,25,996, which may so far be considered satisfactory, as it brings the nominal amount of capital locked up in stores at the close of the year down to nearly Rs. 4,00,000 less than the limit provisionally assigned on this account, which was fixed at 63 lakhs. Certain credits have, however, been passed in the Company's books to general stores which on investigation have proved to be inadmissible and were written back, subsequent to the close of the year, at the request of the Examiner of Railway Accounts. There was, moreover, when the accounts of the year were closed a large accumulation of returned stores which, in accordance with the orders of the Directors, bore no value. These, under recent instructions from the Government of India, will be priced and debited to general stores. These circumstances show that the balance of stores as appearing in the Company's books at close of the year did not accurately represent the stores in stock. But for the erroneous credits and non-debits just explained, the balance would probably have been found to have been in *excess* of the provisionally assigned limit of 63 lakhs.

The amount of guaranteed interest paid to the Company for the year was Rs. 1,24,93,200 (£1,145,210), of which Rs. 1,24,45,361 was disbursed in England, and Rs. 47,839 in India. This

raised the total amount of guaranteed interest paid to the Company since the commencement of operations to Rs. 21,62,37,457, against which the net earnings up to the close of the year amounted to Rs. 14,97,09,309. The deficit borne by Government was thus Rs. 6,65,28,148; but as the net earnings quoted above include surplus profits, the moiety of which repaid to the Company up to date was Rs. 73,49,494, the actual deficit earnings, as compared with guaranteed interest which has had to be made good by Government, is increased to Rs. 7,38,77,642. This is a little over one-third of the total guarantee.

Revenue.

The results of working during the past official year are contrasted with those for 1879-80 in the following table :—

Main heads.	1880-81.	1879-80.	Increase in 1880-81.	Decrease in 1880-81.
	Rs.	Rs.	Rs.	Rs.
Gross earnings	2,58,87,607	2,42,72,880	16,14,727	.....
Gross expenses	1,41,17,512	1,45,67,090	.....	4,49,578
Net earnings ...	1,17,70,095	97,05,790	16,14,727	4,49,578
Total increase in 1880-81 ...			20,64,305	.....

As a detailed comparison of these figures is not, however, practicable in consequence of main heads only being shown in the Company's monthly revenue accounts, the plan which has hitherto been followed of examining the working results obtained during the *calendar* year 1880 as exhibited in the printed half-yearly accounts will again be adopted.

These results, compared with those for 1879, are shown in the subjoined statement :—

Main heads.	1880.	1879.	Increase in 1880.	Decrease in 1880.
	Rs.	Rs.	Rs.	Rs.
Gross earnings	2,49,53,253	2,52,64,327	.....	3,11,074
Gross expenses	1,38,47,702	1,50,73,726	.....	12,26,024
Net earnings ...	1,11,05,551	1,01,90,601	9,14,950	.....

Before proceeding to a consideration of the above figures, it may be pointed out that, under the system recently adopted by the Company with the concurrence of the Secretary of State and the Government of India, the gross and net earnings recorded in the printed accounts included certain sums for which credit was taken by the Company, but which were subsequently found to be irrecoverable. No allowance was made for these in the published half-yearly accounts, which in this respect may therefore be said to be somewhat misleading. The amount found to be irrecoverable, but for which undue credit was taken in 1879, was Rs. 9,718, and in 1880 Rs. 16,407. In the latter year there were also short debits to working expenses to the extent of Rs. 18,822, *viz.*, Rs. 15,072 on account of the Hancock overbridge at Mazagon and a bonus of Rs. 3,750 sanctioned in favor of one of the Company's engineers. If these various items are allowed their due effect, the net earnings shown above for 1879, would be reduced to Rs. 1,01,80,883 and those for 1880 to Rs. 1,10,70,322; but as these reductions are not perhaps of sufficient importance to be noticed, considering the magnitude of the figures of which they form part, the comparison between the two years will proceed on the figures appearing in their respective printed accounts, as shown in the table last given. From this it will be seen that the net earnings for 1880 have improved by 9 per cent. over those for 1879.

The guaranteed interest for the year amounted to Rs. 1,24,93,200, so that the net earnings show a deficit of Rs. 13,87,649, or 11 per cent. of the guarantee. (This deficiency amounted to Rs. 22,55,245 in 1879, which was equal to 18 per cent. of the guarantee.) The average rate of interest paid by Government during 1880 on the interest bearing capital paid into treasury was 4·89 per cent., while the net earnings thereon averaged only 4·35 per cent., the deficiency being thus a little more than ½ per cent. of the interest paid. Taking into account, however, the irrecoverable earnings of the year and the repayment to the Company of its moiety of surplus profits, *viz.*, Rs. 5,54,047 which are included in the net earnings for 1880 shown in the table, the amount of the latter remaining in the hands of Government as a set-off against the guarantee is equivalent to about 4 per cent. only of the interest bearing capital, against an average of 4·89 per cent. actually paid to the Company, as stated above.

The year's work is compared in some other general respects with 1879 in the figures given below :—

	1880.	1879.	Increase in 1880.	Decrease in 1880.
Percentage of expenses to earnings ...	55	60	.....	5
Tonnage of goods hauled (paying weight) ...	1,112,766	1,098,953	13,813	.....
Number of passengers carried	4,751,944	4,496,556	255,388	.....
Train mileage worked (excluding light running)	5,866,644	6,308,323	.....	441,679
	Rs.	Rs.	Rs.	
Net earnings per train mile	1·89	1·61	0·28	.....
Net earnings per mile open	8,705	7,987	718	.....

It will thus be seen that in some of the most important respects the results obtained are more favorable than those for 1879.

Earnings.

The gross earnings of the year were derived from the five main sources of receipt to the extent under each indicated below :—

Main heads.	1st half.	2nd half.	Total.	Percentage of each to total.
	Rs.	Rs.	Rs.	Rs.
Coaching traffic	30,64,746	30,66,158	61,30,904	25
Goods traffic	1,11,14,577	71,99,567	1,83,14,144	73
Telegraph earnings	26,764	28,136	54,900	.....
Steam-boat service	.....	.....	.....	.....
Sundries	2,47,692	2,05,614	4,53,306	2
Total ...	1,44,53,779	1,04,99,475	2,49,53,254	100

The totals shown in column 4 of the preceding statement are compared below with those recorded for 1879 :—

Main heads.	Totals for 1880.	Totals for 1879.	Increase in 1880.	Decrease in 1880.
	Rs.	Rs.	Rs.	Rs.
Coaching traffic	61,30,904	68,82,222	48,682	.....
Goods traffic	1,83,14,144	1,85,21,797	.....	2,07,653
Telegraph earnings	54,900	50,480	4,420	.....
Sundries	4,53,306	6,09,828	.....	56,522
Total ...	2,49,53,254	2,52,64,327	53,102	2,64,175
			Net decrease in 1880 ...	3,11,073

Coaching Traffic.

The increase shown above in the earnings from coaching traffic is mainly the result of improvements in the receipts from the second and coolie classes of passengers, but these were considerably reduced by a falling off in the third class. The various fluctuations which combined to produce the net improvement of Rs. 48,682 during 1880 will, however, be more clearly seen from the following statement comparing the earnings under the principal heads of coaching traffic with those recorded for 1879. (The deduction of Rs. 2,560 on account of irrecoverable earnings of previous periods, which appears in the column for 1879, was made during the first half of that year, before the system of writing off such items in the printed accounts was abandoned.)

Main heads of Abstract I.	1880.	1879.	During 1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Passengers, first class	4,45,390	4,32,357	13,033	.....
Do. second class	9,27,893	8,50,773	77,120	.....
Do. third class	9,75,227	11,25,369	.....	1,50,142
Do. coolie class	28,82,319	27,15,929	1,66,390	.....
Do. season tickets	14,959	14,307	652	.....
Do. luggage	3,15,628	2,94,571	21,057	.....
Military baggage	86,446	78,426	8,020	.....
Carriages, horses and dogs	1,07,740	1,09,353	.....	1,613
Military ditto	75,240	1,27,824	.....	52,584
Parcels	2,60,186	2,88,356	.....	28,170
Special trains	13,091	17,495	.....	4,404
Miscellaneous	1,075	1,967	.....	892
Post Office, haulage, &c.	6,545	6,751	.....	206
Do. special trains	12,339	14,478	.....	2,139
Do. parcels	6,825	6,825	.....	.....
Less—	61,30,903	60,84,781	2,86,272	2,40,150
Outstandings irrecoverable	.....	2,560	2,560	.....
Total ...	61,30,903	60,82,221	2,88,832	2,40,150
Net increase in 1880 ...			48,682	.....

The increase in the receipts from first class passengers, amounting as it does to only 3 per cent., does not appear to call for notice. In the second class the improvement of Rs. 77,120 may be set down exclusively to the large movements of troops during the second half of 1880 in connection with the military operations in Afghanistan, the earnings from this source during that half-year having exceeded those for the second half of 1879 by Rs. 83,372. In other respects the variations in the second class traffic were of small moment.

As regards the large falling off of Rs. 1,50,142 in the earnings from third class, it will be convenient to consider it in connection with the corresponding improvement of Rs. 1,66,390 appearing in the coolie class. These variations are probably due to the preference which is no doubt felt by the majority of native passengers for the slow train service at the 2½ pies per mile rate as compared with the mail service at 4 pies. The following figures, showing the fluctuations in the two classes during the past six years, appear to establish this. It will be noticed that while the third class traffic, both in numbers and earnings, has steadily declined, there has been a corresponding yearly improvement in the coolie class:—

	Numbers.		Earnings.	
	Third Class.	Coolie Class.	Third Class.	Coolie Class.
			Rs.	Rs.
During 1875				
„ 1876	888,370	2,299,551	15,71,551	16,83,772
„ 1877	485,864	3,373,305	11,60,941	23,04,666
„ 1878	477,800	3,550,496	11,64,286	24,91,822
	460,503	3,807,757	9,66,051	26,09,452
„ 1879	428,825	3,860,165	9,13,289	27,15,929
„ 1880	395,394	4,126,602	7,95,032	28,82,319

Notwithstanding that there has thus been to a large extent a transfer of passengers from the more expensive to the cheaper class, the following figures, combining *both* classes for the past seven years, show that there has been, on the whole, a substantial increase in the native passenger traffic both in the numbers carried and the earnings therefrom :—

	Numbers carried.	Earnings.
		Rs.
During 1874	2,624,371	28,80,950
„ 1875	3,187,921	32,55,323
„ 1876	3,859,169	34,65,607
„ 1877	4,028,296	36,56,108
„ 1878	4,268,260	35,75,503
„ 1879	4,288,990	36,29,218
„ 1880	4,521,996	36,77,351
Increase in 1880 as compared with 1874	1,897,625	7,96,401
Equal to per cent.	72	28

The coaching traffic interchanged with foreign lines shows, on the whole, a satisfactory improvement during the year as compared with 1879. The principal business done was with the East Indian and connected lines and with the Madras and Nizam's Railways, but particulars of the interchanged traffic generally will be found in the subjoined table, which of course shows only the Great Indian Peninsula Railway portion of the receipts :—

Foreign Railways.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Bombay, Baroda and Central India	11,827	16,886	.....	5,059
Madras	1,97,302	2,18,901	.....	21,599
East Indian, &c.	7,36,895	7,06,357	30,538	.....
Holkar and Sindia-Neemuch	92,356	83,882	8,474	.....
Dhond and Manmad	44,410	22,368	22,042	.....
Khamgaon	4,693	9,748	.....	5,055
Amraoti	20,128	27,087	.....	6,959
Wardha Valley	2,292	3,632	.....	1,340
Nizam's	1,76,359	1,58,897	11,462	.....
Total ...	12,80,262	12,47,758	72,516	40,012
Net increase in 1880 ...			32,504	.....

The passenger train mileage run (including proportion of mixed) as obtained from the Government analyses of the Company's revenue accounts compares as follows with that run during 1879 :—

	1880.	1879.	1880.	
			Increase.	Decrease.
Half-year ending—				
30th June	984,624	876,414	108,210	.....
31st December	1,012,279	1,035,360	.....	23,081
Total ...	1,996,903	1,911,774	108,210	23,081
Net increase in 1880 ...			85,129	.....

This increase is no doubt principally due to 827 more passenger trains having been run in 1880 than in 1879, the numbers having been 6,367 and 5,540 respectively. The total coaching traffic receipts divided over this mileage average Rs. 3-1-1 per mile in 1880 against Rs. 3-2-10 per mile in 1879 and Rs. 3-7-2 per mile in 1878.

The average distances travelled during the year were practically the same as for 1879, particulars in this respect being afforded in the following statement, from which season ticket passengers are excluded :—

	During 1880.				During 1879.			
	1st Class.	2nd Class.	3rd Class.	4th Class.	1st Class.	2nd Class.	3rd Class.	4th Class.
Half-year ended—								
30th June ...	177·73	191·97	112·22	53·00	173·72	194·15	119·37	54·63
31st December ...	180·00	229·43	108·37	54·61	178·00	220·85	120·16	53·58
Mean for the whole year ...	178·86	261·70	110·29	53·80	175·86	207·50	119·76	54·10
Average of all classes...	136·16				139·80			

Under coaching traffic the other heading which appears to require explanation is "military carriages, horses and dogs," which shows a large decrease of Rs. 52,584. This is due to the receipts under this head having been abnormally swelled during 1879 in consequence of the transport of a large number of ponies despatched from the Bombay Presidency for the war in Afghanistan. The variations in other details of the coaching traffic are not important; but as regards the earnings from work done for the Postal Department it may be explained that fresh arrangements have been entered into by which the Company are to be paid a fixed sum of Rs. 72,000 per annum for service rendered in this respect. Before leaving the subject of coaching traffic it may be interesting to show what the saving has been to Government during the past five years in respect of payments to the Company for the conveyance of troops, military baggage and horses, &c., the sum so paid being shown in the following table in comparison with the amounts that would have been charged to the public at ordinary rates for similar services :—

	At ordinary public rates.	At reduced Government rates.	Difference in favor of Government.
Half-year ended—	Rs.	Rs.	Rs.
30th June 1876	4,59,621	2,82,067	1,77,554
31st December 1876	4,43,115	2,64,470	1,78,645
30th June 1877	4,28,684	2,46,675	1,82,009
31st December 1877	5,46,063	3,62,828	1,83,235
30th June 1878	7,10,487	4,35,311	2,75,176
31st December 1878	11,20,509	7,47,332	3,73,177
30th June 1879	8,42,848	4,98,714	3,44,134
31st December 1879	9,72,400	5,88,989	3,83,411
30th June 1880	8,28,046	5,15,249	3,12,797
31st December 1880	8,98,577	5,88,771	3,09,806
Total saving to Government in 5 years ...		27,19,944	

Goods Traffic.

The decrease in earnings from this source is shown to have been Rs. 2,07,653. Further details will be found in the subjoined statement, in which the receipts from the various main heads are compared with those for 1879 :—

Main heads.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Merchandise, general	1,77,45,723	1,79,89,095	.....	2,43,372
Military stores	2,01,187	1,67,516	33,671	.....
Railway materials for construction	29,209	30,770	.....	1,561
Coal	1,14,555	1,24,629	.....	10,074
Revenue stores carried free	.....	.....	.....	.....
Live stock, public	86,861	74,800	12,061	.....
„ military	195	.....	195	.....
Rents, demurrage, &c.	30,287	32,765	.....	2,748
Interest on outstanding bills	.....	.....	.....	.....
Miscellaneous	1,06,127	1,14,486	.....	8,359
Total ...	1,83,14,144	1,85,34,061	45,927	2,65,844
Less—Outstandings irrecoverable	.....	12,264	.....	12,264
Net "Goods" earnings ...	1,83,14,144	1,85,21,797	45,927	2,53,580
			Net decrease in 1880 ...	2,07,653

This decrease, though considerable in itself, is less than 1½ per cent. of the goods earnings for 1879. The fluctuations in the various classes of which the head "Merchandise, general," consists are set forth below :—

Classes.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Special class	83,69,944	87,13,686	.....	3,43,742
First „	16,82,640	20,36,913	.....	3,54,273
Second „	51,02,930	47,10,434	3,92,496	.....
Third „	15,81,269	15,30,364	50,905	.....
Fourth „	8,11,157	5,66,605	2,44,552	.....
Fifth „	97,783	4,31,093	.....	3,33,310
Total ...	1,76,45,723	1,79,89,095	6,87,953	10,31,325
			Net decrease in 1880 ...	3,372

The chief commodities in which the above variations took place were —

Increases.	Rs.	*Decreases.*	Rs.
Bagging	11,178	Coal and coke	10,074
Commissariat stores ...	37,941	Cotton	38,249
Cocoanuts	94,062		
Dried roots and colour ...	48,401	Fruits, dried	78,494
Hides and horns	2,43,645		
Piece-goods, English ...	1,49,701	Food-grains	20,91,701
Grocery	24,124		
Ground-nuts	9,187	Ghee	65,472
Wheat	8,71,268		
Metals and hardware ...	23,533	Opium	1,65,201
Mohwa flowers and seeds ...	35,332		
Oil	64,679	Sugar and jagri	2,05,896
Twist	39,567		
Wool	28,979	Til seed	1,37,794

The quantities conveyed during 1879 and 1880 were 26,00,491 and 27,16,155 maunds respectively, which consisted of full-pressed and unpressed cotton in the following proportions :—

	1879.	1880.
	Mds.	Mds.
Full-pressed	4,20,424	6,40,930
Unpressed	19,80,067	20,75,225
	26,00,491	27,16,155

Of the total cotton imported into Bombay from all sources during 1880, 61 per cent. was brought by the Great Indian Peninsula Railway.

The following table exhibits particulars of the cotton carried by the Company during the past five *seasons* :—

		Season ending 30th June.				
		1876.	1877.	1878.	1879.	1880.
		Mds.	Mds.	Mds.	Mds.	Mds.
Quantities	unpressed ...	4,64,060	4,54,576	7,07,100	5,58,162	5,54,199
	full-pressed ...	17,20,591	21,72,107	28,00,496	19,40,523	18,99,678
		Rs.	Rs.	Rs.	Rs.	Rs.
Earnings	unpressed ...	5,01,428	4,53,624	6,58,798	6,48,427	5,49,239
	full-pressed ...	22,54,440	26,69,741	35,31,628	23,07,022	21,69,094

The exceptionally good traffic shown above for 1878 was due mainly to the abundance of the crop in the Berars, though a larger outturn than usual was recorded for all the cotton-growing districts served by the line.

The fluctuations in some of the other principal commodities carried by the Company during the past six years will be found below :—

Cotton Piece-goods.

	Mds.	Rs.
1875	4,73,178	7,23,114
1876	4,72,861	7,07,228
1877	5,24,979	7,71,862
1878	5,75,134	8,41,518
1879	7,11,552	10,65,743
1880	7,88,153	12,07,521

Foodgrains and wheat.—The year 1877 includes the famine traffic. The falling off in 1880 occurs in foodgrains. In wheat there was an actual *increase* of Rs. 8,71,268.

		Mds.	Rs.
1875	... ...	58,74,061	23,89,689
1876	... ...	1,15,56,139	58,28,695
1877	... ...	2,00,22,869	1,21,53,134
1878	... ...	1,24,97,838	68,28,838
1879	... ...	1,16,06,752	56,90,996
1880	... ...	97,35,488	44,70,563

Linseed.—The traffic in this commodity, which was exceedingly bad in 1878 and 1879, suddenly revived during 1880.

		Mds.	Rs.
1875	... ...	23,28,468	16,38,138
1876	... ...	35,87,419	19,36,596
1877	... ...	29,24,258	16,12,215
1878	... ...	8,01,603	4,16,749
1879	... ...	6,73,600	3,44,446
1880	... ...	24,70,148	13,38,754

Salt.—Under this head there is a steady, if not a rapid, advance. The traffic consists mainly of Kharaghora salt received from the Bombay, Baroda and Central India Railway :—

		Mds.	Rs.
1875	... ...	19,21,099	10,52,670
1876	... ...	23,00,027	11,61,143
1877	... ...	23,48,729	11,27,535
1878	... ...	26,75,367	12,90,776
1879	... ...	28,76,165	14,09,668
1880	... ...	29,36,319	14,37,971

Tilseed.—The fluctuations in this article are remarkable. The rate for conveyance was reduced to that of grain from the 1st October 1875 :—

		Mds.	Rs.
1875	... ...	7,26,625	3,93,784
1876	... ...	5,28,574	2,54,110
1877	... ...	9,36,187	5,16,211
1878	... ...	11,52,144	6,34,167
1879	... ...	12,62,994	6,81,908
1880	... ...	10,33,266	5,44,114

Opium.—The falling off in 1880 is not attributed to lesser production. Stocks are believed to have been withheld in consequence of the decline in rates obtainable in China. The exports from Bombay to that country during 1880 amounted to only 19,128 chests as compared with 25,552 chests in 1879. The Indian drug is also said to be giving way in favor of that grown in Persia and in China itself.

The goods traffic interchanged with foreign lines exhibits a large decrease during the year as compared with 1879. This decrease, which amounts to Rs. 28,35,320, is made up as follows :—

	Increase.	Decrease.
Traffic interchanged with the—	Rs.	Rs.
East Indian Railway	.....	24,60,787
Madras Railway	.....	2,33,102
Bombay, Baroda and Central India Railway ...	.....	1,59,287
Holkar and Sindia-Neemuch Railway ...	8,711	.....
Dhond and Manmad Railway	1,14,412	.....
Khamgaon Railway	.....	1,28,180
Amraoti Railway	.....	1,67,347
Wardha Coal Railway	72,324	.....
Nizam's Railway	.....	80,433
Nagpur and Chhattisgarh Railway	1,98,369	.....
...		
Total ...	3,93,816	32,29,136
Deduct increases ...	.....	3,93,816
Net decrease during 1880 ...	.....	28,35,320

The large decrease in traffic interchanged with the East Indian Railway occurred mainly in foodgrains received from that line, in which alone a falling off of 28,87,138 maunds and Rs. 18,37,885 was recorded. The traffic in wheat, sugar, and jagri and spice seeds also declined to a considerable extent. Most of the decreases shown above against other lines may be set down as due to the falling off in foodgrains. A large increase appears against the Nagpur and Chhattisgarh State Railway, which is merely nominal, as that line was not opened for traffic during 1879.

The average mileage over which the total public merchandise traffic of all classes was conveyed during the year is shown below in comparison with that for 1879 :—

	1880.	1879.
	Miles.	Miles.
30th June	319	352
31st December	323	321
Mean for the year ...	321	336½

Decrease in 1880, 15½ miles.

The amount received during the year for haulage for rolling stock, *viz.*, Rs. 1,06,127, was principally on account of—

	Rs.
Punjab Northern Railway	70,224
Dhond and Manmad	15,005
Madras	13,071
Nizam's	3,987
Wardha Coal	2,014
Patna-Gya	1,135

The total paying weight of goods carried during the year (*i.e.*, exclusive of 208,312 tons of stores carried free on revenue account) was 1,112,766 tons against 1,098,953 tons in 1879. There was thus, notwithstanding the decrease in receipts which has been pointed out, an actual increase in the paying weight lifted during 1880. The average rates per ton per mile obtained for goods of *all* classes compare as follows with those for 1879—

	1880.	1879.	Increase in 1880.
	Pies.	Pies.	Pies.
1st half	9·76	9·38	0·38
2nd „	9·92	9·73	0·19

but the average distances over which goods of all classes were carried were 317 miles only during the first half of 1880 against 347 miles during the corresponding half of 1879. During the second halves of the two years the distances were practically the same, *viz.*, 318·64 miles in 1880 against 317·90 miles in 1879.

The goods train mileage, including, as in the case of coaching traffic, a proportion of the mileage derived from mixed trains, is compared in the following table with that similarly run for 1879 :—

	1880.	1879.	1880.	
			Increase.	Decrease.
Half-year ending—				
30th June	2,296,927	2,730,717	.....	433,790
31st December	1,590,606	1,478,752	111,854	...
Total ...	3,887,533	4,209,469	111,854	433,790
		Net decrease in 1880 ...		321,936

The average rate per train mile at which the goods receipts accrued to the Company was Rs. 4-11-4 against Rs. 4-6-5 in 1879. These results are somewhat better than those calculated in this way under coaching traffic, and point to a satisfactory working of the goods train service during the year.

Telegraph Traffic.

The number of paid messages sent during the year was 60,549 against 51,391 in 1879—an increase of 18 per cent. This gave rise to an increase in earnings of Rs. 4,420.

Sundries.

The net decrease of Rs. 56,521 in earnings under this head is made up of the fluctuations shown in the following table:—

Particulars.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Hire of locomotives	47,923	1,562	46,361	...
„ vehicles	18,950	1,27,925	...	1,08,975
„ cranes	203	143	60	...
Mileage of vehicles over foreign lines	1,87,423	2,59,193	...	1,770
Rents of joint stations	14,459	10,979	3,480	...
Interest on stores, &c., at stations	615	520	95	...
Insurance on opium, specie, &c.	1,719	27,457	...	25,738
Toll on Carnac Bandar traffic	29,615	28,988	627	...
Rents of dwelling-houses	80,367	78,556	1,811	...
„ refreshment-rooms	10,362	9,868	494	...
Hire of Khamgaon line	140	...	140	...
Commission on town dues	6,334	6,965	...	631
Fees on share transfers	5,260	6,584	...	1,324
Sales of unclaimed and damaged goods	17,085	12,519	4,566	...
Unpaid or unclaimed salaries	4,912	6,151	...	1,239
Sales of grass	4,588	4,257	331	...
Profits of workshops	3,778	526	3,252	...
Sales of revenue stores	19,574	27,635	...	8,061
Total ...	4,53,307	6,09,828	61,217	2,17,738
		Net decrease in 1880 ...		56,521

The increase under "Hire of locomotives" is due to a number of engines having been lent to the Punjab Northern and Dhond and Manmad State lines. The falling off under "Hire of vehicles" and "Mileage of vehicles over foreign lines," which go together, is the result of the large decrease in traffic interchanged with foreign railways, which has just been noticed. The other variations are not important, except as regards the decrease under "Insurance on opium, specie, &c.," which is due to the abolition of compulsory insurance of the former.

Working Expenses.

The net decrease during the year, as already shown, was Rs. 12,26,024, which is made up of the following :—

Main heads.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Maintenance of way, &c.	34,58,658	41,08,375	.....	6,49,717
Locomotive expenses	48,88,406	52,54,095	.....	3,65,689
Carriage and Wagon expenses	19,35,515	16,41,886	2,93,629	.....
Traffic expenses	20,34,590	21,83,325	.....	1,48,735
General charges	10,35,717	11,00,848	.....	65,131
Special and miscellaneous expenses	4,94,816	7,85,197	.....	2,90,381
Total ...	1,38,47,702	1,50,73,726	2,93,629	15,19,653
			Net decrease in 1880 ...	12,26,024

The saving of Rs. 6,49,717 under "Maintenance of way, works and stations" is equivalent to 15 per cent. of the outlay for 1879, and is the result of the several variations in the main heads of Abstract A, shown below :—

Main heads of Abstract A.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	3,82,895	4,02,571	.....	19,676
Permanent-way	22,83,092	28,27,911	.....	5,44,819
Bridges, &c.	4,33,362	3,84,551	48,811	.....
Stations and buildings	2,00,074	2,75,336	.....	75,262
New minor works	6,078	3,762	2,316	.....
Unclassified expenditure	1,79,920	2,35,716	.....	55,796
	34,85,421	41,29,847	51,127	6,95,553
Less—				
Transfers and special funds	26,763	21,472	5,291	.....
Net outlay ...	34,58,658	41,08,375	45,836	6,95,553
			Net decrease in 1880 ...	6,49,717

Of the net decrease shown above, 84 per cent. occurs under the head "Maintenance and renewal of permanent-way." This appears to be due generally to lesser work having been found necessary during the year, in consequence of the thoroughness with which the line was maintained during previous periods. Operations are believed also to have been restricted to some extent by the want of material, 45 miles of permanent-way complete having been sold to Government for use on the Sukkur-Quetta State Railway. Under "General superintendence," which as a rule includes charges of a fixed nature, the comparatively large saving of nearly Rs. 20,000 is merely nominal, and is due partly to the absence of officers on furlough during the year, and partly to the expenditure for 1879 having included a bonus of Rs. 10,000 to an engineer on his retirement from the Company's service. The increase under "Bridges, &c.," arises mainly from the erection of a new wire fencing on districts 1, 2 and 4, and from the substitution of stone for wooden posts on district No. 3. Under "Stations and buildings" part of the saving shown is the result of an exceptional debit in 1879 to the extent of Rs. 21,000 for 10 years' arrears of maintenance of the Jubbulpore joint station, which, by an oversight apparently on the part of the East Indian Railway, was not billed for from time to time as it should have been. There was also lesser outlay during 1880 on special works chargeable to revenue. The saving under "Unclassified expenditure" is directly due to the lesser outlay under permanent-way, which led to a smaller sum being charged to revenue on account of "loss by exchange" on permanent-way stores purchased in England.

The next main head of revenue outlay, *viz.*, "Locomotive expenses," exhibits a decrease of Rs. 3,65,689, which is equal to about 7 per cent. of the outlay for 1879. Details of this will be found in the following statement. It is made up of a saving of Rs. 4,47,781 in the first half, reduced by an excess of Rs. 82,092 in the second half of 1880 as compared with 1879:—

Main heads of Abstract B.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	3,13,936	2,97,617	16,319	.....
Running expenses	11,68,731	12,28,553	.....	59,822
Fuel	19,34,240	21,79,057	.....	2,44,817
Water	1,10,479	1,04,949	5,530	.....
Oil, tallow, &c.	1,70,892	1,95,949	.....	25,057
Maintenance, &c., of locomotives, &c.	9,80,825	9,90,325	.....	9,500
New minor works	2,418	4,927	.....	2,509
Unclassified expenditure	2,06,885	2,52,718	.....	45,833
Total ...	48,88,406	52,54,095	21,849	3,87,538
			Net decrease in 1880 ...	3,65,689

The increase under "General superintendence" is caused by the filling up of certain appointments which were vacant in 1879. These were the assistant superintendentships at Sholapur and Budnera, the foundry foremanship and assistant foremanship of the smith-shops at Parel, and the running shed inspectorship at Byculla. It may be noted here that the revised organisation of the locomotive establishments which was sanctioned by Government and the Board took effect from the 1st July 1880, and that some of the changes noticed above was the result. Part of the increase is also due to lesser amount having been transferred in 1880 to debit of capital account of departmental supervision connected with the construction of rolling stock, paid for in the first instance by revenue.

The decrease of Rs. 59,822 under "Running expenses" may be set down to the decreased engine mileage run during the year, which amounted to only 6,580,101 miles, against 6,926,626 miles in 1879. The proportion of overtime allowances to drivers and firemen as compared with the fixed wages was 52 per cent. in 1880 against 54 per cent. in 1879. The head "Fuel" shows a large saving of Rs. 2,44,817, which is about 67 per cent. of the net decrease under all heads. The quantity used decreased correspondingly to the extent of 13,266 tons. These results are no doubt due generally to the decreased engine mileage run during the year, as just noticed; but the following further particulars will be

interesting. The quantities of the various descriptions of coal used during 1880 compare as follows with those for 1879 :—

Description.	1880.	1879.	1880.	
			Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
English	83,542	91,031	...	7,489
Warrora	9,085	18,547	...	9,462
Bengal	9,379	12,389	...	3,010
Mohpani	12,787	6,621	6,166	...
Total ...	114,793	128,588	6,166	19,961
Net decrease in 1880 ...				13,795

The following table shows particulars of the results recorded in connection with the consumption of coal during the two halves of the year compared with 1879 :—

		30TH JUNE.		31ST DECEMBER.	
		1879.	1880.	1879.	1880.
		Tons.	Tons.	Tons.	Tons.
Quantity consumed ...	English	56,305	46,461	34,726	37,081
	Indian	22,321	20,740	15,236	10,511
		Rs.	Rs.	Rs.	Rs.
Cost per ton	English	19·37	18·19	18·62	19·18
	Indian	11·01	9·5	13·06	13·12
	Average	16·81	16·01	16·92	17·87
		As.	As.	As.	As.
Cost per engine mile		5·16	4·70	4·78	4·65
		lbs.	lbs.	lbs.	lbs.
Quantity used per mile		43·11	41·18	39·39	36·45

The quantities of the various kinds of coal received by the Company and the average cost of each per ton during the two halves of the year are compared with the corresponding period of 1879 in the subjoined statement :—

Description.		30TH JUNE.		31ST DECEMBER.	
		1879.	1880.	1879.	1880.
English	Quantity ...	Tons. 31,088	Tons. 42,089	Tons. 47,909	Tons. 42,031
	Cost per ton ...	Rs. 19-8-0	Rs. 18-3-2	Rs. 18-8-0	Rs. 18-10-2
Nerbudda	Quantity ...	Tons. 5,773	Tons. 7,086	Tons. 4,833	Tons. 2,303
	Cost per ton ...	Rs. 9-0-0	Rs. 9-0-0	Rs. 9-0-0	Rs. 9-0-0
Bengal	Quantity ...	Tons. 8,890	Tons. 1,373	Tons. 7,193	Tons. 3,125
	Cost per ton ...	Rs. 19-3-6	Rs. 19-3-6	Rs. 19-7-3	Rs. 19-11-3
Barrakar	Quantity ...	...	Tons. 961	...	Tons. 2,940
	Cost per ton ...	...	Rs. 19-9-0	...	Rs. 19-8-5
Warrora	Quantity ...	Tons. 10,280	Tons. 6,656	Tons. 7,223	Tons. 3,152
	Cost per ton ...	Rs. 7-7-8	Rs. 6-7-6	Rs. 9-15-6	Rs. 6-7-6

The rate per ton shown against English coal includes landing in Bombay ; that for Nerbudda coal is the rate paid at the mine, including loading into trucks ; those for Bengal and

Barrakar coal include freight to Jubbulpore, and that for Warrora coal includes freight to Wardha.

Particulars of the consumption of wood fuel during the two years will be found below:—

	30th June.				31st December.			
	1879.		1880.		1879.		1880.	
Quantity consumed	Tons	722	Tons	1,134	Tons	839	Tons	956
Cost per ton	Rs.	4-15-7	Rs.	5-5-4	Rs.	5-6-1	Rs.	5-1-7
Cost per train mile	As.	0·02	As.	0·03	As.	0·03	As.	0·03
Cost per engine mile	„	0·01	„	0·03	„	0·02	„	0·03
Quantity used per train mile	lbs.	0·45	lbs.	0·77	lbs.	0·75	lbs.	0·82
Ditto engine mile	„	0·40	„	0·69	„	0·66	„	0·73

The decreased charge on account of oil, tallow, waste, &c., expended on engines in work is due to reduced prices paid for the former during 1880, cocoanut oil having been purchased at an average of Rs. 16-10 per cwt. in that year against Rs. 20-5-6 in 1872, and castor oil at Rs. 14-6 against Rs. 19-4.

The next head of the locomotive expenditure, *viz.*, "Maintenance of engines, &c.," shows a small saving of Rs. 9,500; but in passing the revenue account for the first-half of 1880, the Acting Consulting Engineer for Railways stated that he "could not certify that sufficient had been done during the half-year towards maintenance of the Company's rolling stock, and that he had recommended that one lakh of rupees should be reserved from net earnings as expenditure properly due to the period." Of this sum, Rs. 30,000 was separately stated to be due to short outlay on the maintenance of *engines*. The Company's officers demurred to this view of the condition of its rolling stock, and the matter was some time under correspondence between the Secretary of State and the Board of Directors, the result of which was that the surplus profits of the half-year were divided without regard to the retention of the one lakh of rupees referred to above, but the deduction thereof was held over temporarily and the question was referred back to the authorities in India for further inquiry and report.

The accounts of the first half of the year include charges for two new Kitson's passenger engines placed on the line in substitution of two condemned light passenger engines by the same makers which had been running since 1856 and 1857, the distance run by both together during their lifetime having been 549,724 miles. During the latter half of the year five new engines were also put on the line in replacement of the five Dübs' engines sold to Government for State Railways in 1879, and a sixth in replacement of an old passenger engine condemned as unserviceable and broken up.

The decrease under "Unclassified expenditure" is due to a lesser sum having been charged as "loss by exchange," the quantity of English coal used having been less than in 1879, as already shown.

The total locomotive expenses, divided over the net train mileage, give the following results as compared with 1879:—

	1880.	1879.	1880.	
			Increase.	Decrease.
	As.	As.	As.	As.
First half	12·47	13·33	...	0·86
Second half	14·33	14·31	0·02	...
Mean ...	13·40	13·82	0·01	0·43
Net mean decrease in 1880 ...				0·42

"Carriage and Wagon expenses" is the only head of working which shows an increase during the year as compared with 1879. This amounts to Rs. 2,93,629, particulars of which are set forth below :—

Main heads of Abstract C.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	94,024	77,644	16,380	.....
Repairs of coaching vehicles	6,43,911	4,36,746	2,07,165	.....
„ goods „	9,50,058	8,71,058	79,000	.....
Cleaning and oiling	1,79,889	1,96,994	.....	17,105
Unclassified expenditure	84,858	67,844	17,014	.....
	19,52,740	16,50,286	3,19,559	17,105
Less—				
Transferred to Fire Insurance Fund	17,225	8,400	8,825	.....
Net outlay ...	19,35,515	16,41,886	3,10,734	17,105
		Net increase in 1880 ...	2,93,629	.....

The increase under "General superintendence" is, as in the case of Locomotive expenses, due to certain new appointments having been made during the year and to certain vacancies which existed in 1879 having been filled up, that is, an Assistant Superintendent and a Foreman Carriage Examiner were appointed at Bori Bandar and the Trimming and Painting Shop Foreman's place at Parel was filled up. The increase under "Repairs of coaching and goods vehicles," taken together, amounts to Rs. 2,86,165, and the remarks just made respecting repairs of engines are applicable to this head also. The expenditure on this account during the year was very unequally distributed between its two halves, Rs. 8,99,000 having been booked during the second or deficit, against only Rs. 6,95,000 in the first or surplus, half. The other heads of this abstract present no features of importance.

"Traffic expenses" have decreased to the extent of Rs. 1,48,735, being nearly 10 per cent. of the outlay during 1879. The following table shows how this saving is made up :—

Main heads of Abstract D.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	2,34,851	2,33,355	1,496	.....
Station staff	8,35,126	8,42,796	.....	7,670
Train staff	6,09,132	6,54,027	.....	44,895
Fuel, &c., and general stores	1,81,774	2,45,096	.....	63,322
Clothing	28,981	33,290	.....	4,309
Printing, stationery, and tickets	75,251	90,112	.....	14,861
Delivery of parcels	3,746	3,387	359	.....
Miscellaneous expenses	4,708	7,999	.....	3,291
Payments to other lines	43,787	46,075	.....	2,288
Unclassified expenditure	17,234	27,188	.....	9,954
Total ...	20,34,590	21,83,325	1,855	1,50,590
			Net decrease in 1880 ...	1,48,735

The decrease in Station staff is due to several crossing stations which were opened in 1879 having been closed during the year. The employment of a lesser number of guards and brakesmen accounts for the decrease under Train staff, an average of 100 men a month having been at work against 111 in 1879. The largest saving in the abstract appears under "Fuel and general stores," and is due to several causes. The closure of the crossing stations just mentioned led to a saving in the consumption of oil, and the latter was obtained at lower rates during the year, as previously explained. Kerosine was also to a large extent substituted for cocoanut oil during the year. The decrease is further swelled by no tarpaulins and but few ropes

having been issued during the first half of the year. The only other head in the abstract which appears to require explanation is "Printing, stationery, and tickets," the decrease under which is due to the outlay for 1879 having been abnormally swelled by the printing of new books of rates and fares, by the issue of a large number of new telegraph books, and by a number of obsolete forms and books having been withdrawn from stock during that year.

The next main head of working, "General charges," shows a small saving of Rs. 65,131, of which details are given in the following statement:—

Main heads of Abstract E.	1880.	1879.	1880. Increase.	1880. Decrease.
	Rs.	Rs.	Rs.	Rs.
Home expenditure	94,671	95,718	.....	1,047
Indian management—				
Salaries, &c., of general offices	4,44,267	4,44,604	.....	337
Rents and other charges	80,955	79,407	1,548	.....
Police	1,76,681	1,79,826	.....	3,145
Advertising	4,188	3,227	961	.....
Electric telegraph	2,19,605	2,76,687	.....	57,082
Unclassified expenditure	15,350	21,379	.....	6,029
Total ...	10,35,717	11,00,848	2,509	67,640
			Net decrease in 1880 ...	65,131

The most noticeable feature in the above table is the saving of Rs. 57,082 under "Electric telegraph." This was occasioned by a part of the outlay on the provision and fixing of block signalling instruments, which was charged to revenue in 1879, having been written back, under due sanction, to debit of capital during the first half of 1880. The block system of signalling, which was extended from Budnera to Nagpur during the year, is now in force all over the line. The subjoined statement shows the numbers of paid messages despatched during the two years and the average cost and receipt per message:—

		Number of paid messages.	Average cost of each.	Average receipts from each.	Net loss per message.
		Rs.	Rs.	Rs.	Rs.
First half of	1879	27,806	5·58	0·98	4·60
	1880	29,852	3·15	0·90	2·25
Second half of	1879	23,585	5·16	0·99	4·17
	1880	30,697	4·09	0·92	3·17

It should be stated, however, that the following number of *service* messages were also despatched during the four periods named above:—

First half of	1879	1,181,531
	1880	654,755
Second half of	1879	473,730
	1880	565,009

Reducing the average cost per message by these, the *profit* per message was as follows:—

		Average receipt.	Average cost.	Net profit.
		As.	As.	As.
First half of	1879	15·68	2·05	13·63
	1880	14·40	2·20	12·20
Second half of	1879	15·84	3·91	11·93
	1880	14·72	3·37	11·35

It may be noted as regards Police that from the commencement of 1881 a part of the cost not exceeding 30 per cent. of the whole will be borne by Government as representing the cost of police kept up for the preservation of law and order as distinct from watch and ward. The saving of Rs. 6,029 which appears under "Unclassified expenditure" is entirely due to lesser debits for "loss by exchange" on English stores charged to revenue.

"Special and miscellaneous expenses" show a larger relative saving than any other main head of working, the decrease of Rs. 2,90,381 being equivalent to 37 per cent. of the outlay for 1879. The variations in detail will be seen below :—

Main heads of Abstract G.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Law charges	(Cr.) 2,870	40,524	.....	43,394
Compensation	11,941	1,47,891	.....	1,35,950
Rates and taxes	34,950	13,863	21,087	.....
Payments to other lines	4,48,544	6,05,667	.....	1,57,123
Miscellaneous	12,073	516	11,557	.....
	5,04,638	8,08,461	32,644	3,36,467
Less—Transferred to Fire Insurance Fund...	9,822	23,264	.....	13,442
Net outlay ...	4,94,816	7,85,197	32,644	3,23,025
			Net decrease in 1880 ...	2,90,381

The heads "Law charges" and "Compensation" may be treated together, the saving under both being due to fewer claims made against the Company in connection with the losses during the famine traffic of 1877. Most of these claims were settled during 1878 and 1879, which swelled the payments during those years to an abnormal extent. The large increase under "Rates and taxes" is due to five years' arrears of police and lighting rates, which had been previously in dispute, having been paid to the Bombay Municipality during 1880. The head "Payments to other lines" exhibits a noteworthy saving of Rs. 1,57,123, which is equivalent to 54 per cent. of the total saving appearing in the abstract. This was due to the large falling off in traffic received from foreign lines, as explained in the remarks on the merchandise traffic of the year. The transactions of the year in regard to rolling stock interchanged with other lines show a balance of Rs. 1,72,495 against the Company, as particularised below :—

	Rs.	A.	P.	Rs.	A.	P.
Paid to East Indian Railway				1,96,674	1	0
„ Bombay, Baroda and Central India Railway ...				1,18,495	10	0
„ Madras Railway				25,902	10	0
„ Nizam's Rilway				6,825	1	3
„ Wardha Coal Railway				11,075	9	0
„ Dhond and Manmad Railway				945	3	0
				3,59,918	2	3
Less—						
Received from—						
East Indian Railway	97,491	0	0			
Bombay, Baroda and Central India Railway	6,842	1	0			
Madras Railway	26,209	1	0			
Nizam's Railway	21,824	14	0			
Wardha Coal Railway	1,235	4	0			
Dhond and Manmad Railway ...	33,629	9	0			
Amraoti Railway	191	6	0			
				1,87,423	3	0
Net amount paid to foreign lines ...				1,72,494	15	3

The increase of Rs. 11,557 under Miscellaneous is due to outlay on account of education, which was formerly charged to the various departments, now being included in this abstract. A sum of Rs. 3,000 was also specially disbursed during 1880 as a contribution towards the erection of a hospital at Jubbulpore.

Bombay, Baroda and Central India Railway.

Godhra Extension.—This was sanctioned in the month of March 1881, and a contract for the construction of the work, with the exception of the low level bridge over the Mahi, which it is proposed to construct departmentally, has been let to Mr. Nowroji Pistonji, who has on previous occasions carried out works for the Railway Company and Government.

Nerbudda Viaduct.—The progress with the work has been satisfactory. It was nearly completed* at the close of the year. The Company's Consulting Engineer, Sir J. Hawkshaw, was led by the disaster to the Tay Bridge in 1879 to make some additions to the design for the Nerbudda bridge in the form of wind-ties between the upper booms of the main girders and short girders between the pier columns at low-water level. These are being fixed.

* Opened for traffic on the 16th May 1881.

The old bridge will be removed as soon as possible after the new bridge is opened, and the effect of its removal on the direction taken by the stream in future monsoon floods will be observed. Hopes are entertained that the erosion of the south bank of the river above bridge will cease, and in any case it will be some time before it turns the abutment of the new bridge, which extends 480 feet further to the south than the old one; but it is probable that the embankment forming the approach to the bridge from the south will require further protection by means of spurs along the eastern or up-stream face.

A revised estimate for the Broach station was sanctioned. The construction of the station is in progress, and it will, it is hoped, be ready for use in the course of a few months.

The junction station for passengers at Ahmedabad has met requirements so far, but it is proposed to roof in the State Railway platform; and in order to meet the wants of first and second class through passengers, the number of which is likely to increase, it is proposed to provide a block of waiting rooms, refreshment rooms, and lavatories, with certain amount of sleeping accommodation as part of the joint station. Meanwhile certain minor alterations have been made in the arrangements of the rooms in the existing building.

The junction station for interchange of goods at Sabarmati has been found inadequate for the heavy traffic requiring transhipment, and alterations are proposed with a view for providing for the prompt interchange of goods between the two railways and for dealing with a much larger traffic than that of this season.

The junction arrangements with the Bhavnagar-Gondal Railway at Wadhwan have met the requirements of this season, but require some improvement in the shape of increased accommodation for passengers.

The new station at Parel was completed.

The following minor works were carried out during the year:—

New station at Parel.
Additional signalling arrangements at Grant Road, Mahim, and Bandora.
Erection of running shed at Bulsar.
Water-crane and engine-lift at Ahmedabad.
Protection from monsoon for passenger platforms at Marine lines and Charni Road station.

Construction of Locomotive and Rolling Stock.

The construction of the following new stock was sanctioned during the year—

10	goods engines	May 1880
6	first class carriages	February 1881
200	high-sided wagons	"
67	covered goods	"
14	goods brakes	"

Also to 18 covered goods being built to replace the same number of condemned ballast wagons.

CAPITAL.

The state of the capital account as it existed at the close of 1880 is set forth below:—

	£	£	Rs.
Capital authorised		8,675,000	9,46,36,363
Capital subscribed		8,156,937	8,39,84,767
Capital expended—			
On construction account ...	7,526,555		
" stores on stock	327,823		
" suspense accounts	87,313		
		7,767,065	8,47,31,626
Balance available—			
Of capital authorised		907,935	99,04,737
" subscribed		389,872	42,53,141
Amount expended on—			
Way and works		6,419,908	7,00,35,363
Rolling stock		1,106,647	1,20,72,512
Average expenditure per mile—			
On way and works		14,459	1,57,734
" rolling stock		2,492	27,185

There was a new credit during the year to the construction account of £19,668 (Rs. 2,14,560). This was mainly the result of the transfer from revenue of Rs. 11,67,693, being the surplus profits of the Company earned during the first half of the year. These, according

to agreement, were paid over to capital in reduction of the cost of the new Nerbudda bridge. There was also a credit to capital of £25,000 (Rs. 2,72,727), which was the contribution from the Fire Insurance Fund on the same account. The construction expenditure of the year was further reduced by credits amounting to Rs. 2,69,076, being the value of duplicate parts of engines, which were charged to capital when the engines were placed on the line, but which remained in stock and were used subsequently to the extent of Rs. 1,98,727 free of charge in repairs and renewals during non-surplus half-years. The matter came to light on the recent transfer of locomotive stocks from the Locomotive Superintendent to the Storekeeper, and the necessary adjustments were passed through the accounts and admitted provisionally by the Consulting Engineer, subject to the sanction of Government. Of the value of duplicate parts originally charged in error to the construction account, a portion, to the extent of Rs. 70,349, remained on hand at close of the year, and was accordingly written back to the debit of general stores.

In addition to the credits named above aggregating Rs. 2,69,076, which were taken to represent the value of duplicate parts used free of charge during non-surplus half-years (*viz.*, Rs. 1,98,727), plus the value of parts remaining unused at the close of year (*viz.*, Rs. 70,349), a further credit of Rs. 46,760 was proposed to be given to capital by debit to revenue during the first or surplus half of 1881 as representing the value of duplicate parts used during past surplus periods. The total charge to revenue, *viz.*, Rs. 2,45,487, was divided in these proportions between a non-surplus and a surplus period, on the ground that during the 21 years in which revenue escaped charge there were 34 of the former and 8 of the latter periods, so that $\frac{34}{42}$ of the total sum was charged to revenue during the second half of 1880 and $\frac{8}{42}$ held over to be charged during the first half of 1881. On the representation, however, of the Consulting Engineer for Railways, the Government of India have since decided that this distribution is not strictly equitable; and, on the ground that the engines were few in number and needed little renewal during the first 10 years of their lives, it has been ordered that this period should be excluded from the calculation altogether. During 11 years that remained surplus profits were earned eight times up to the close of 1880, so the total charge to revenue, *viz.*, Rs. 2,45,487, has now to be divided between the last half of 1880 and the first half of 1881 in the proportions of $\frac{14}{22}$ and $\frac{8}{22}$ respectively, which gives Rs. 1,56,219 against the former and Rs. 89,268 against the latter period.

Excluding these large and some smaller special credits to capital, the actual outlay on works during the year was Rs. 15,16,182, which was incurred principally on the following projects :—

	Rs.
New Nerbudda bridge	7,61,809
Strengthening Sampta bridge	16,268
„ Dysar „	10,207
Sabarmati junction, platform, &c.	12,748
„ staff quarters	26,789
Ahmedabad post office building	6,822
Broach additions and alterations	30,417
Baroda water-supply	5,736
Parel, police and porters' quarters	6,717
„ new station and well	10,858
Bandora overbridge	7,722
Rolling stock—	
Engines	1,98,800
Carriages and wagons	1,88,997
Establishments	53,877

The outlay on locomotive stock was mainly on the erection of 8 additional passenger engines, which after considerable correspondence was sanctioned by the Government of India in March 1879. The original proposal, which was made in view of the opening of the Western Rajputana State Railway, was for the erection of 10 engines; but this number was afterwards reduced to eight. The expenditure on carriage and wagon stock was booked principally on account of the "construction of 10 second and 60 third class carriages" which was sanctioned by the Government of India in the same month as the engines referred to above on the insufficiency of the then existing numbers of those classes of stock being represented to them by this Government. The building of a post office within railway limits at the Ahmedabad station was undertaken by the Company on behalf of the Postal Department, who are to pay a rental to the Company of 7½ per cent. per annum on its capital cost, in addition to the actual expenditure incurred half-yearly on account of repairs. It was also stipulated that in the event of the Postal Department desiring at any time to relinquish the building, its capital cost should be refunded to the Company, that department being entitled to remove the materials. (It may be mentioned that buildings are being erected on these terms at Bhusawal, Khandwa, and Wadi on the Great Indian Peninsula Railway, but that no expenditure was reported against any of them up to the close of the year.) As regards the outlay on the new Nerbudda bridge, it may be noted that, up to the close of the year, funds to the extent of Rs. 28,14,970 had been provided for its erection out of the surplus profits earned by the Company during the

first halves of 1877, 1878, 1879 and 1880, supplemented by Rs. 2,72,727 contributed by the Fire Insurance Fund, so that less than 3½ lakhs will be required from the surplus profits of the first half of 1881 to cover its estimated cost of 34¼ lakhs. It will thus be seen that capital has not been called upon to bear any portion of its cost.

The stores suspense account of the Company, including the value of materials in transit, shows a net reduction of Rs. 2,10,735 during the year; but the balance of stocks in hand at its close is still about 14¼ lakhs in excess of the limit of capital provisionally assigned by the Government of India to be locked up on this account, which was fixed at Rs. 21½ lakhs. It will take some time at the present rate of reduction to bring the stocks down to this limit, but due attention will continue to be given to the matter.

On other capital suspense accounts a net credit balance of Rs. 9,52,500 (£87,313) appears at the close of the year. This is due to the large payment of upwards of 6 lakhs which was made to the Company *in advance* in March 1879 for the construction of 330 vehicles for State lines. The amount was credited to a suspense account, which, however, was not adjusted at the close of the year, as the whole of the stock had not been constructed and delivered then; but an early settlement is now probable, as final bills have been submitted by the Company. The balance of subscribed capital available to the Company on the 31st December 1889 was £389,872, about a fourth of which will probably be absorbed in the construction of the Godhra extension, which was recently sanctioned.

The guaranteed interest paid for the year amounted, both in England and India, to £400,515 (Rs. 43,69,254), which raised the total payments from the commencement on this account to £6,862,980, or about 84 per cent. of the subscribed capital. The net amount earned again on revenue account, including the surpluses transferred to capital in aid of the new Nerbudda bridge, was £3,897,860, or about 57 per cent. thereof, so that 43 per cent., or nearly one-half of the guaranteed interest paid to the Company, had been short-earned at close of the year; but the deficit will no doubt be sensibly reduced in future, as both the second and first halves of coming years are expected to show surplus profits. The average rate at which the guarantee was paid to the Company during the year on its interest-bearing capital was 4·93 per cent., while the net earnings thereon averaged 5·34 per cent., so that for the whole year the net earnings covered the guarantee; but allowing for the payment to capital of the surplus profits of its first half, the balance of net earnings was only equal to 4·02 of the interest-bearing capital.

Revenue.

The general results of working during the official year 1880-81 in comparison with those for 1879-80 are noted below:—

Main heads.	1880-81.	1879-80.	1880-81. Increase.	1880-81. Decrease.
	Rs.	Rs.	Rs.	Rs.
Gross earnings	85,61,215	70,23,662	15,37,553	...
Gross expenses	35,61,678	33,28,296	2,33,382	...
Net earnings ...	49,99,537	36,95,366	13,04,171	...

For the reasons given in the Review of the working of the Great Indian Peninsula Railway, the results of the calendar year 1880 will, however, now be considered in relation to those for 1879. These will be found compared in the next table:—

	1880.	1879.	1880. Increase.	1880. Decrease.
	Rs.	Rs.	Rs.	Rs.
Gross earnings	82,44,376	71,52,788	10,91,588	...
Gross expenses	35,09,722	33,59,890	1,49,832	...
Net earnings ...	47,34,654	37,92,898	9,41,756	...
Percentage of expenses to earnings ...	42	47	.....	5
Percentage of net earnings on capital subscribed ...	5·34	4·28	1·06	.....
" " expended ...	5·77	4·40	1·37	.....
Passengers carried	6,237,074	6,365,884	871,190	.....
Tonnage of goods hauled (paying)	572,916	533,156	39,760	.....
Train mileage run for traffic	1,357,359	1,280,415	76,944	.....
	Rs.	Rs.	Rs.	
Net earnings per traffic train mile ...	3·49	2·96	0·53	.....
" " mile open ...	10,652	8,543	2,119	.....
" " " per week ...	91,052	72,940	18,112	.....

This comparison is in all respects favorable to the year under review.

Gross Earnings.

The proportions in which the earnings of the year were contributed by the five main sources of revenue are noted below :—

Main heads of receipts.	1st half of 1880.		2nd half of 1880.		Total for 1880.	
	Amount.	Per cent. of total.	Amount.	Per cent. of total.	Amount.	Per cent. of total.
	Rs.		Rs.		Rs.	
Coaching traffic	14,25,692	28	12,74,830	41	27,00,522	33
Goods traffic	35,01,241	69	16,80,387	53	51,81,628	63
Telegraph earnings ...	15,589	...	12,158	...	27,747	...
Steam-boat earnings ...	...	...	...	...	...	...
Sundries	1,60,370	3	1,74,109	6	3,34,479	4
Total ...	51,02,892	100	31,41,484	100	82,44,376	100

The preceding totals are shown in the following table in comparison with those for 1879 :—

Main heads.	1880.	1879.	1880,	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Coaching traffic	27,00,522	23,20,288	3,80,234	...
Goods traffic	51,81,628	46,17,278	5,64,350	...
Telegraph earnings	27,747	23,765	3,982	...
Steam-boat earnings	...	215	.....	215
Sundries	3,34,479	1,91,242	1,43,237	...
Total ...	82,44,376	71,52,788	10,91,803	215
Net increase in 1880 ...			10,91,588	...

Coaching Traffic.

The increase under this head shown in the preceding statement, *viz.*, Rs. 3,80,234, is equivalent to 16 per cent. of receipts for 1879. It is the net result of the variations in Abstract H of the half-yearly revenue accounts which are shown below :—

Main heads of Abstract H.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Passengers	24,39,882	21,56,516	2,83,366	...
„ luggage	73,117	52,557	20,560	...
Military baggage	12,606	2,761	9,845	...
Carriages, horses and dogs, public ...	31,791	37,904	.....	6,113
„ „ military ...	7,253	3,350	3,903	...
Parcels	1,29,840	64,257	65,583	...
Special trains	2,433	1,143	1,290	...
Post Office	3,600	1,800	1,800	...
	27,00,522	23,20,288	3,86,347	6,113
Less—Outstandings irrecoverable ...	.....	.....	.....	...
Total ...	27,00,522	23,20,288	3,86,347	6,113
Net increase in 1880 ...			3,80,234	...

This increase is due directly to the larger number of passengers carried than in 1879, all classes showing an improvement, the total numbers carried having been 7,020,114 against 6,102,804 in that year—an improvement equal to about 15 per cent. The next statement shows the increases in the different classes, each season's ticket-holder being reckoned as equivalent to 40 ordinary passengers per month :—

Numbers carried.	1880.	1879.	1880.	
			Increase.	Decrease.
First class, ordinary	30,205	21,082	9,123	...
Do. season tickets ...	30,480	27,600	2,880	...
Second class, ordinary	223,216	142,215	81,001	...
Do. season tickets ...	162,840	172,560	.....	9,720
Third class, ordinary	5,438,133	4,880,302	557,831	...
Do. mail trains	545,520	322,285	223,235	...
Do. season tickets ...	589,720	536,760	52,960	...
Total ...	7,020,114	6,102,804	927,030	9,720
Net increase in 1880 ...			917,310	...

The earnings from the various classes of passengers are shown below :—

Earnings.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
First class, ordinary	61,345	59,781	1,564	...
Do. season tickets	4,197	3,621	576	...
Second class, ordinary	1,73,703	1,30,181	43,522	...
Do. season tickets	12,887	14,014	.....	1,127
Third class, ordinary	14,36,059	14,50,188	.....	14,129
Do. mail trains	7,18,756	4,67,676	2,51,080	...
Do. season tickets ...	32,935	31,055	1,880	...
Total ...	24,39,882	21,56,516	2,98,622	15,256
Net increase in 1880 ...			2,83,366	...

The above statements show that the first class traffic increased to the extent of 43 per cent. in the numbers carried, but only by 2 per cent. in the earnings. This is attributed to the large reduction made in the fare from the first day of 1880, *viz.*, from 15 to 12 pies per mile, and to the average distance travelled having been considerably less than in 1879, as shown further on. Much the same results are shown in the second class ordinary traffic, the increase in earnings having been equivalent to only 33 per cent., while numbers carried improved 57 per cent. as compared in 1879. The same explanations apply to this disparity as are put forward for the first class traffic. In the third class ordinary traffic there was an increase in the numbers carried to the extent of 12 per cent., but a *decrease* of 1 per cent. in receipts, and in the mail train traffic an increase of 69 per cent. in numbers, but of only 54 per cent. in receipts. In no class, therefore, have the variations in earnings been proportionate with those in the numbers carried, but the following comparisons of fares and average distances travelled during the two years help to explain this :—

	In 1879.		In 1880.	
	Single.	Return.	Single.	Return.
	Pies.	Pies.	Pies.	Pies.
First class fare per mile	15	22½	12	20
Second class do.	7	10½	6	10
Third class, ordinary, fare per mile	2½	4½	2½	4½
Do. mail do.	4	6	3	.....

Average distances travelled.

	1879. Miles.	1880. Miles.
First class	43·39	36·46
Second class	31·96	30·81
Third class, ordinary	23·03	20·54
Do. mail	73·88	84·16

It was pointed out in the Review for 1879 that, in consequence of the reduction of the ordinary third class fare from 3 to 2½ pies per mile, which had been made just previously, and which began to be generally known during that year, a large number of passengers appeared to be deserting the mail for the ordinary trains; but the figures for 1880 seem to show that the reduction in the latter year of the *mail* train fare from 4 to 3 pies has had the effect of drawing a good part of this traffic back to the mail trains, for whereas the numbers of ordinary third class passengers increased by 12 per cent. only, those in the mail trains improved by 69 per cent. during 1880. In the *earnings* from these two subdivisions of the third class traffic this also appears, it having just been shown that there was a falling of 1 per cent. in the ordinary and an improvement of 54 per cent. in the mail train receipts.

The season-ticket traffic for the year is shown in comparison with that for the previous four years in the following statement :—

Class.	1876.	1877.	1878.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.
First	3,692	4,708	4,352	3,621	4,197
Second	12,912	13,412	14,739	14,014	12,887
Third	26,579	30,020	29,298	31,055	32,935
Total ...	43,183	48,140	48,389	48,690	50,019

The above figures show that, though this traffic appeared to have reached its maximum and was stationary during the years 1877, 1878 and 1879, an improvement took place during the year 1880, which there is reason to believe, as far as can be judged at present, will continue. The whole of the above traffic may be said to have been Bombay local and suburban, but a large proportion of the latter consists of other than season-ticket holders. The actual growth of the Bombay local traffic, including season-ticket and other stray passengers, during the past five years is set forth below :—

	First halves of					Second halves of				
	1876	1877.	1878.	1879.	1880.	1876.	1877.	1878.	1879.	1880.
Numbers	1,222,363	1,249,660	1,399,612	1,559,849	1,777,375	1,211,949	1,296,513	1,416,715	1,574,517	1,882,391
Rupees	94,543	95,701	1,01,635	1,09,871	1,19,496	94,265	97,547	99,578	1,08,241	1,26,530

Combining the above figures for *whole* years, the local passenger traffic for 1880 has increased as follows :—

	Passengers. No.	Receipts. Rs.
1879	525,400	27,914
1878	843,439	44,813
1877	113,593	52,778
1876	1,225,454	57,218

That is to say, in numbers there was an increase during 1880 equivalent to 50 per cent. as compared with 1876, and in earnings an improvement of 30 per cent. These figures show how great a boon the local passenger train service is to the inhabitants of Bombay, of whom upwards of 3½ millions were carried during the year, which is equivalent to an average of about 10,000 passengers per day.

The fluctuations in the remaining passenger traffic of the line during the past five years are shown in the subjoined statement:—

		1876.	1877.	1878.	1879.	1880.
Passengers carried	No.	2,544,196	2,670,648	2,756,475	2,968,438	3,360,348
Earnings therefrom	Rs.	19,84,313	20,35,124	19,96,444	19,38,404	21,93,856

During the five years ending with 1880 there has thus been an increase of 816,152 in the numbers of passengers of all classes using the line (other than those carried locally), which is an improvement equal to 32 per cent., and in receipts an increase of Rs. 2,09,543, which is equal to 10 per cent. Of the total passengers conveyed over the line yearly, it will be seen from the foregoing statements that the numbers conveyed locally, within a distance of 10 miles, exceed in most cases those conveyed over all the rest of the line put together. The numbers for 1880 were—

	No.	Per cent. of total.
Local passenger traffic	3,659,766	52
Other ditto	3,360,348	48
Total for the year ...	7,020,114	100

The increase in "Passengers' luggage" is the result of the increase in the numbers of passengers carried during the year, as just explained. Those under "Military baggage" and "Military carriages, horses and dogs" are due to the more active movements of troops, while the decrease in "*Public* carriages, horses and dogs" is caused by the receipts for 1879 having been abnormally swelled by the festivities at Baroda in December of that year. The head "Parcels" shows a large increase of Rs. 65,583, the receipts on this account being in fact more than double those for 1879. This is remarkable, viewed in connection with the fact pointed out in the last Administration Report, *viz.*, that the parcels traffic on this Railway had been steadily declining during the preceding five years, the receipts having fallen from Rs. 78,972 in 1875 to Rs. 64,257 in 1879. The large increase during 1880 is explained to be due to the earnings from fruit and vegetables carried in passenger trains, which were formerly included under merchandise, having from the beginning of the year been shown under this head of *coaching* traffic. The ordinary parcels traffic is also said to have improved satisfactorily during the year, particularly in the despatches from Bombay stations to Baroda, Ahmedabad, and the Rajputana State line. The receipts on account of work done for the Postal Department were exactly double those for 1879 under the operation of the agreement which came into force at the close of that year; but it may be noted that this agreement is now being further considered in consequence of a claim for enhanced remuneration having been put forward by the Company.

The coaching train mileage for the year compares as follows with that for 1879:—

	1880.	1879.	1880.	
			Increase.	Decrease.
	Miles.	Miles.	Miles.	Miles.
First half	270,651	310,349	.....	39,698
Second half	295,824	284,053	11,771	.....
Total ...	566,475	594,402	11,771	39,698
		Net decrease in 1880 ...		27,927

The total coaching receipts divided over this train mileage give Rs. 4-12-3 in 1880 against Rs. 3-14-6 in 1879, the improvement being equal to 20 per cent.

Goods Traffic.

More than half the total increase in the earnings of the year is derived from this source, the improvement in which amounts to Rs. 5,64,350. The details of this are given below:—

Main heads of Abstract I.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Merchandise, general	49,23,818	43,44,344	5,79,474	.....
Military stores	24,094	26,334	.....	2,240
Construction materials	36,276	77,477	.....	41,201
Coal	56,849	16,092	40,757	.....
Live stock	1,29,935	1,42,599	.....	12,664
Rents and demurrage, &c.	10,656	11,341	.....	685
	51,81,628	46,18,187	6,20,231	56,790
Less—Outstandings irrecoverable ...	.....	909	.....	909
Net Receipts ...	51,81,628	46,17,278	6,20,231	55,881
		Net increase in 1880 ...	5,64,350	.....

This is equal to 12 per cent., and there was also an increase of 7 per cent. in the paying weight lifted, 572,916 tons having been hauled against 533,156 tons in 1879. The total ton-mileage was 93,981,985 against 89,105,668. In addition to the above, 55,079 tons of stores were carried free on revenue account, representing a ton-mileage of 6,680,957 against 59,597 tons with a ton-mileage of 7,597,992 in 1879.

The fluctuation in the six classes of which "Merchandise, general," is composed are shown below:—

Classes.	Quantities carried.				Earnings.			
	1880.	1879.	Increase.	Decrease.	1880.	1879.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.	Rs.	Rs.	Rs.	Rs.
Special	299,595	317,488	...	17,893	17,24,246	19,46,252	...	2,22,006
First	139,737	123,688	16,049	...	12,89,349	11,61,006	1,28,343	...
Second	60,563	43,340	17,223	...	7,71,571	5,59,577	2,11,994	...
Third	54,512	27,070	27,442	...	10,26,299	5,94,559	4,31,740	...
Fourth	1,085	971	114	...	35,172	31,739	3,433	...
Fifth	1,244	861	383	...	77,181	51,211	25,970	...
Total ...	556,736	513,418	61,211	17,893	49,23,818	43,44,344	8,01,480	2,22,006
	Net increase in 1880 ...		43,318	...	Net increase in 1880		5,79,474	...

In most commodities traffic increased, some of the largest improvements having been in—

	Increases. Rs.
Bagging	19,269
Coal	40,756
Cocoanuts	12,371
Cotton	4,58,622
Ghee	15,858
Metal	23,164
Opium	28,759
Piece-goods	60,066
Salt	33,088
Seeds	57,146
Stone	17,265
Sugar	25,079
Sundries	1,15,562
Wool	36,430

while there were decreases under the following heads:—

	Decreases. Rs.
Grain	38,400
Hides	18,364
Jagri	68,832
Fruit and vegetables	30,955
State Railway stores	1,83,659

The large increase in cotton would have been more satisfactory if the comparison had been made with a good or even an average season; but the years 1879 and 1878 were, in regard to this commodity, exceptionally bad. Compared with the season of 1877, there was an actual *decrease* in receipts of Rs. 33,387, but the quantity carried was greater by 11,132 tons. The following figures show the traffic done in cotton during the past nine seasons, *i.e.*, since the extension of the line to Wadhwan gave the Company a command over some of the most important marts in Kathiawar:—

	Quantity carried. Tons.	Earnings. Rs.
Season of 1872	41,247	10,27,131
„ 1873	36,538	8,08,210
„ 1874	44,500	9,39,790
„ 1875	48,753	8,86,819
„ 1876	42,876	8,60,290
„ 1877	40,933	7,94,106
„ 1878	19,035	3,59,307
„ 1879	19,375	3,47,219
„ 1880	52,065	7,60,719

It will thus be seen that, while the quantity carried during 1880 was notably larger than in any preceding year, the earnings were (with the exception of the bad season of 1879 and 1878) less than any previously recorded. This disparity between quantities and receipts during 1880 is mainly due to the recent reduction in rates, which it was considered advisable to make in order to compete with the sea route from Broach, Surat, and Dholera. The imports of cotton into Bombay from Broach and Surat by sea and rail respectively during the past four seasons will be seen from the following figures:—

How imported.	1877.		1878.		1879.		1880.	
	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.
By sea	1,386	11	5,776	73	6,693	70	8,046	41
„ rail	11,199	89	2,154	27	2,816	30	11,508	59
Total ...	12,585	100	7,930	100	9,509	100	19,554	100

The remaining increases in the goods traffic are satisfactory, but do not appear to call for special explanations, as they appear to be due generally to the revival of trade throughout the country from the depression which ensued after the famine seasons of 1877 and 1878.

The large decrease under State Railway materials is due to the exceptionally heavy traffic in this respect which occurred during 1879 in connection with the Western Rajputana and His Highness the Gaekwar's Railways, which were in active progress during that year.

The traffic interchanged with foreign lines has been steadily increasing for some years past, and may be expected to improve rapidly now that through communication has been established with the North-West Provinces *viâ* the Rajputana Railway. The following figures exhibit this growth since the beginning of 1877 :—

	Quantities interchanged.	B., B. & C. I. Railway portion of receipts.
	Tons.	Rs.
1877	65,927	5,55,222
1878	1,04,153	9,01,869
1879	1,39,386	11,81,551
1880	1,51,133	14,55,606

The quantity interchanged has thus improved by 192 per cent. and the receipts by 162 per cent. as compared with 1877. The great bulk of the traffic with foreign lines consists of the exports of salt; but traffic is also brisk in exports of cocoanuts, jagri, mowrah, seeds, timber, tobacco, and sundries. Grain also forms an important feature of the interchanged traffic, but its course is uncertain, and latterly it has been subject to somewhat violent fluctuations. It should be noted here, however, that though there has been so marked an improvement during the year in the total amount of traffic interchanged with other Companies, this has occurred only in the exports. In *imports* there was a falling off of 12,515 tons as compared with 1879. This explains the decreased payments to other lines for mileage of their stock run over the Company's system during the year.

The explanation of the decrease of imports is the large amount of grain received from the Great Indian Peninsula Railway during 1879; and this decrease would of course have been more noticeable but for the traffic from the Rajputana Railway.

The total traffic exchanged with that line during the first half of the year was Rs. 3,72,798.

The mean average receipts per ton and per ton mile obtained during the two halves of the year combined, on paying goods traffic, compare as follows with those for the two preceding years :—

	Average receipts per ton.	Average mileage of traffic.	Average receipts per ton mile.
	Rs. A. P.	Miles.	Pies.
Mean for 1878	8 14 4	165	10·35
„ 1879	8 13 9	173	9·85
„ 1880	9 5 4	172	10·39

The goods train mileage for the year, including a proportion of mixed, is shown below in comparison with that for 1879 :—

	1880.	1879.	1880.	
			Increase.	Decrease.
Half-year ending—	Miles.	Miles.	Miles.	Miles.
30th June	519,432	440,754	78,678	...
31st December	271,452	245,259	26,193	...
Total ...	790,884	686,013	104,871	...

Excluding the earnings received from rents demurrage, &c., which have no relation to the train mileage, the balances of goods receipts divided over the above mileages average Rs. 6-8-7 per mile during the year against Rs. 6-11-5 during 1879.

The net results of the goods traffic as derived from the Government analyses of the Company's Revenue Accounts for the two halves of the year were as follows :—

	Per vehicle per mile.			Per ton per mile.		
	Average receipts.	Average cost.	Average profit.	Average receipts.	Average cost.	Average profit.
Half-year ended—	Pies.	Pies.	Pies.	Pies.	Pies.	Pies.
30th June	38·06	12·49	25·57	10·34	3·39	6·95
31st December	39·61	21·11	18·50	10·53	5·61	4·92
Mean for the whole year ...	38·83	16·80	22·03	10·43	4·50	5·93

These results are somewhat better than those obtained in 1879, when the profit per vehicle per mile was only 19·66 pies and per ton per mile 5·28 pies.

The sundry earnings of the Company show an increase of Rs. 1,43,237, which is equal to 75 per cent. as compared with 1879. This occurs mainly under the heads "Hire of locomotives" and "Mileage of vehicles over foreign lines," as will be seen from the subjoined statement :—

Main heads of Abstract K.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Hire of locomotives	1,06,681	13,934	92,747	...
Do. vehicles	1,077	11,941	...	10,864
Mileage of vehicles over foreign lines	1,17,585	90,275	27,310	...
Rent of joint stations	24,727	2,737	21,990	...
Tolls on bridges	1,810	1,810	...	...
Rents of dwelling-houses	19,093	19,076	17	...
Fees on share transfers	1,787	2,294	...	507
Sales of unclaimed and damaged goods ...	541	560	...	19
Do. revenue stores	5,700	2,933	2,767	...
Platform tickets	2,091	1,967	124	...
Toll on Colaba-Dadur Junction traffic ...	15,281	10,892	4,389	...
Workshop receipts	21,090	19,819	1,271	...
Unclaimed salaries	377	1,605	...	628
Other receipts	11,560	7,502	4,058	...
Superintendence of Gaekwar's lines ...	5,079	4,497	582	...
Total ...	3,34,479	1,91,242	1,55,255	12,018
Net increase in 1880 ...			1,43,237	...

The large receipts from "Hire of locomotives" are abnormal, being due to the loan of engines to the Punjab Northern State Railway in connection with the operations in Afghanistan. The increase under "Mileage of vehicles over foreign lines" is the result of the largely increased traffic interchanged with other lines, as already explained, the bulk of which consisted of exports in the Company's vehicles to the Great Indian Peninsula Railway. The head "Rent of joint stations" shows a large increase; but this is due to the debit for 1879 being for six weeks only of that year, *viz.*, from the 15th November, when the southern section only of the Western Rajputana State Railway was opened for traffic. There was a decrease of Rs. 10,864 under "Hire of vehicles," which was due to fewer wagons having been lent to the Great Indian Peninsula Railway and to contractors. The head "Rents of dwelling houses" is practically the same as for 1879, but the following figures comparing outlay with income on this account for the two years may be interesting :—

	1880.	1879.
	Rs.	Rs.
Rents of dwelling-houses	19,093	19,076
Repairs of staff quarters	9,398	8,422
Net increase ...	9,695	10,654

Working Expenses.

These amounted to Rs. 35,09,722 against Rs. 33,59,890, the increase having been equal to about 4½ per cent. The gross earnings having, however, improved at the rate of 15 per cent., the ratio of expenses to earnings fell from 47 per cent. in 1879 to 42 per cent. in 1880—a rate, it may be noted, lower than any previously obtained. Deducting the special debit to locomotive expenses in 1880 of Rs. 1,93,727 on account of duplicate engine gear, previously explained, the gross expenses for the year are reduced to 40 per cent. of the earnings. The net increase of Rs. 1,49,832 in the working expenses of 1880 is made up as follows :—

Main heads.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Maintenance of way and works, &c. ...	7,58,079	7,24,506	33,573	...
Locomotive expenses	13,92,695	11,47,329	2,45,366	...
Carriage and Wagon expenses	2,24,815	3,18,439	...	93,624
Traffic expenses	5,76,807	5,57,667	19,140	...
General charges	4,84,109	4,89,750	...	5,641
Steam-boat service	1,270	3,313	...	2,043
Special and miscellaneous	71,947	1,18,886	...	46,939
Total ...	35,09,722	33,59,890	2,98,079	1,48,247
		Net increase in 1880 ...	1,49,832	...

Maintenance of Way, Works and Stations.

The total outlay on this account is practically the same as for 1879, the net increase of Rs. 33,573 being less than 5 per cent. of the expenditure during that year; but there was an increase in the "Maintenance and renewal of permanent-way," alone amounting to Rs. 52,563 or 16 per cent. more than the outlay incurred on this account during the preceding year. The other variations in the details of Abstract A will be seen from the following statement :—

Main heads of Abstract A.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	1,54,171	1,58,425	...	4,254
Permanent-way	3,78,053	3,25,490	52,563	...
Bridges, &c.	1,21,064	1,30,018	...	8,954
Stations and buildings	62,091	69,935	...	7,844
New minor works	4,176	13,465	...	9,289
Unclassified expenditure	38,524	27,173	11,351	...
Total ...	7,58,079	7,24,506	63,914	30,341
		Net increase in 1880 ...	33,573	...

The increase shown above under permanent-way is due to the larger numbers of rails and English sleepers used during the year. In the second half of 1880 alone, 624 rails and 9,582 sleepers more were used than in the corresponding half of 1879. This also gave rise to an increased charge under "Unclassified expenditure" for loss by exchange. The decreases under the other main heads are not important. Before making any comparison, however, of the cost per mile of line maintained during the two years, it should be pointed out that they both contain special debits and credits in connection with damages at the old Nerbudda bridge, and that at the close of 1880 a special credit of Rs. 28,089 was booked for value of stores remaining unused in the hands of permanent-way inspectors, which, under the system previously in force, were not thus specially credited. Excluding these and some smaller items of an exceptional nature, the rate of maintenance per mile was in 1880 Rs. 1,738 against Rs. 1,616 in 1879. In 1878 the rate per mile, similarly calculated, was Rs. 1,680.

Locomotive Expenses.

This head shows a larger variation than any other, the increase of Rs. 2,45,366 over 1879 being equal to nearly 21½ per cent., but, as already noticed, the accounts of the second half of 1880 include a large special adjusting debit of Rs. 1,98,727, being the cost of duplicate engine gear used free of charge during the preceding 21 years in repairs and renewals on revenue account. Excluding this item, the increase over 1879 is reduced to Rs. 46,639, or a little more than 4 per cent. A comparison of the details of Abstract B will show how this is made up, the above special debit being shown as a separate item :—

Main heads of Abstract B.	1880.	1879.	1880. Increase.	1880. Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	98,329	97,188	1,141	...
Running expenses	2,29,091	2,23,068	6,023	...
Fuel	5,50,181	5,56,487	...	6,306
Water	39,445	43,762	...	4,317
Oil, tallow, &c.	22,511	23,500	...	989
Maintenance, &c., of engines, &c.	2,24,105	1,69,625	54,480	...
Unclassified expenditure	30,306	33,699	...	3,393
Total ...	11,93,968	11,47,329	61,644	15,005
Net ordinary increase in 1880 ...			46,639	
Add—Special debit in 1880 for duplicate year ...			1,98,277	
Total increase in 1880 ...			2,45,366	

The head "General superintendence" shows a small increase, which is due to the absence of the Assistant Superintendent during a portion of 1879. It may be noted here that measures were recently adopted for the reorganisation of the Locomotive Superintendent's office, which resulted in a saving under this head during the year. The increase under "Running expenses" is a consequence of the increase of 49,187 in the total engine mileage run as compared with 1879. The proportion of overtime allowances to fixed salaries paid to drivers and firemen was 62 per cent. as compared with 58 per cent. in the preceding year; but this was no doubt due to the greater amount of overtime worked in dealing with the large increase in traffic. The percentage of overtime to salaries has, however, always been high on this line as compared with the other Guaranteed Companies. This recently attracted the attention of the Government of India, and the matter is now under consideration.

"Fuel" shows a small saving of Rs. 6,306, which is due to the lower price at which coal was issued. The quantity of the latter consumed was *greater* by 1,096 tons than in 1879, and there was also an increased consumption of wood amounting to 115 tons.

The average consumption per train mile and per 1,000 ton miles during the two years is shown in comparison below:—

	Per train mile.		Per 1,000 ton miles.	
	Coal.	Wood.	Coal.	Wood.
Half-year ended—	lbs.	lbs.	lbs.	lbs.
30th June ... 1880	52·65	0·82	158·18	2·45
30th June ... 1879	52·74	0·63	154·48	1·85
31st December ... 1880	46·76	0·66	166·68	2·35
31st December ... 1879	47·97	0·53	174·54	1·92

The head "Maintenance and renewal of engines and machinery" shows an increase of Rs. 54,480, or 32 per cent. as compared with 1879. This is partly due to a special debit of Rs. 16,160 on account of the balance of cost recovered from revenue of five out of the eight new engines recently put on the line, and partly to the ordinary repairs of locomotive stock having been of a heavier nature during both halves of 1880 than in 1879. The total locomotive expenses during the two years, exclusive of the large debit in 1880 of Rs. 1,98,727 on account of duplicate engine gear, compare as follows:—

	Per train mile.	Per 1,000 ton miles.
Half-year ended—	As.	Rs.
30th June ... 1880	14·00	2·63
30th June ... 1879	13·95	2·55
Increase in 1880 ...	0·05	0·08
31st December ... 1880	14·18	3·16
31st December ... 1879	14·51	3·30
Decrease in 1880 ...	0·33	0·14

The decrease in the watering charges of this department, notwithstanding the increased traffic and engine mileage, is noteworthy, and is due to the Company having made its own arrangements for the supply of water at certain stations where the Municipality of Bombay raised its rate from 2 to 12 annas per 1,000 gallons in 1879, as noticed on page 43 of the last Administration Report. It may be explained finally that the head "Oil, tallow, &c.," similarly shows a saving, with a *heavier* traffic which it caused by these articles having been issued at considerably reduced rates during 1880, the prices during the second halves of the two years comparing as follows:—

	Oil.	Tallow.
	Rs.	Rs. A. P.
1879	18 per cwt.	23 8 0 per cwt.
1880	14 „	21 2 4 „

Carriage and Wagon Expenses.

A saving of Rs. 93,624 appears under this head, which is equal to 29 per cent. as compared with 1879. The following are details:—

Main heads of Abstract C.	1879.	1880.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	32,487	29,838	.....	2,649
Repairs, &c., of vehicles, &c.	1,71,379	2,51,358	79,979	.....
Cleaning and oiling	32,157	30,837	.....	1,320
Unclassified expenditure	7,698	9,030	1,332	.....
	2,43,721	3,21,063	81,311	3,969
Add—				
Reserves for renewal of stock	98,498	.....	.....	98,498
	3,42,219	3,21,063	81,311	1,02,467
Deduct—				
Transfers to the preceding reserves ...	23,780	96,248	72,468	.....
Net Total ...	3,18,439	2,24,815	8,843	1,02,467
			Net decrease in 1880 ...	93,624

The above table shows that, exclusive of the special reserves made in 1879 and the transfers there against both in that year and in 1880, the actual expenditure during the latter year was Rs. 3,21,063 against Rs. 2,43,721 in 1879. This increase was entirely due to the larger number of vehicles repaired during the former period, as shown by the following figures, and to the repairs having, it is said, been of a heavier nature :—

	Coaching stock.	Goods stock.	Total number of vehicles.
30th June 1880	60	905	965
31st December 1880	93	650	743
Total for 1880 ...	153	1,555	1,708
30th June 1879	91	808	899
31st December 1879	71	535	606
Total for 1879 ...	162	1,343	1,505
Net increase in 1880 ...			203

The system of making reserves from revenue in anticipation of work actually done was abandoned during the year under instructions from the Government of India, who further ordered that the "wagon renewal reserve account" should be worked off by the end of 1881. The amount at its credit at the close of 1880 was Rs. 11,753, which will be absorbed during the first half of 1881.

The actual cost of work done during the year, excluding reserves and adjustments connected therewith, compares as follows with 1879 :—

	Per train mile.	Per 1,000 vehicle miles.
	As.	Rs.
Half-year ended—		
30th June ... 1880	2·71	5·96
1879	2·80	6·04
Decrease in 1880 ...	0·09	0·08
31st December ... 1880	5·28	14·18
1879	3·31	9·60
Increase in 1880 ...	1·97	4·58

Traffic Expenses.

The total expenditure on this account was Rs. 5,76,807, being Rs. 19,140, or a little more than 3½ per cent. in excess of that for 1879. Particulars of this excess will be found subjoined :—

Main heads of Abstract D.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
General superintendence	77,775	76,989	786	...
Station staff	3,43,611	3,17,016	26,595	...
Train staff	46,138	41,078	5,060	...
Fuel, lighting, water, general stores	63,358	75,383	...	12,025
Clothing	8,383	11,036	...	2,653
Printing, stationery and tickets	27,347	29,630	...	2,283
Collection and delivery of goods	4,613	3,416	1,197	...
Miscellaneous expenses	1,980	1,980	...	...
Unclassified expenditure	3,602	1,139	2,463	...
Total ...	5,76,807	5,57,667	36,101	16,961
Net increase in 1880 ...			19,140	...

The fluctuations shown above are not of much importance. The largest appears against station staff, and much of it is due to the break at the Nerbunda river, which necessitated the employment of a special staff of laborers. The increase under Unclassified expenditure is due to the same cause, the charges being on account of the steam ferry then established. The other increases are due to the larger traffic dealt with during the year. The largest saving appears under "Fuel, lighting, water, and general stores," but is not easily accounted for in the face of the improved traffic. Nearly Rs. 6,000 of it occurs under "Wagon covers, ropes, &c.," fewer of which probably were required during the year, as the issues on this account were somewhat extensive during the two years immediately preceding. The work done compares as follows with that for 1879 :—

	Per train mile.	Per 1,000 vehicle miles.
	As.	Rs.
Half-year ended—		
30th June { 1880	5·96	13·10
30th June { 1879	6·47	13·97
Decrease in 1880	0·51	0·87
31st December { 1880	7·96	21·40
31st December { 1879	7·70	22·33
Decrease in 1880	0·26	0·93

It may be noted that the accounts for 1879 included under "Traffic expenses" upwards of Rs. 20,000 for payments to the Great Indian Peninsula Railway on account of toll on Carnac bridge traffic, which, on the representations of the Traffic Manager, were transferred in 1880 to the head "Special and miscellaneous expenses." Due allowances have, however, been made in the comparisons given above.

General Charges.

The net saving under this head is about 1 per cent. only of the outlay booked during 1879, and the variations in the details of Abstract E which are shown below are of small consequence :—

Main heads of Abstract E.	1880.	1879.	1880. Increase.	1880. Decrease.
	Rs.	Rs.	Rs.	Rs.
Home expenditure ...	61,338	60,187	1,151	...
Indian management ...	2,54,837	2,57,273	...	2,436
Police	79,871	81,997	...	2,126
Advertising ...	1,047	1,068	...	21
Electric telegraph ...	78,286	79,456	...	1,170
Unclassified expenditure	8,730	9,769	...	1,039
Total ...	4,84,109	4,89,750	1,151	6,792
Net decrease during 1880 ...				5,641

The increase of Rs. 1,151 under "Home expenditure" cannot be fully explained in the absence of the details of which the charges are composed, which are not known in India; but it may be noted that part of it is due to a lesser proportion of London Office expenses having been charged to capital than in 1879. The decrease of Rs. 2,436 under "Indian management" is nominal, Rs. 2,000 having been credited to the expenses of the Audit and Accounts Department in connection with the supervision of His Highness the Gaekwar's State lines, while formerly the full sum charged to the Baroda Darbar on this account was treated as earnings. The

saving under "Police" occurs principally under the head of "Clothing." The total outlay on account of general charges per train mile compares as follows with 1879 :—

	1880.	1879.	Decrease in 1880.
	As.	As.	As.
June	4·90	5·29	0·39
December	6·83	7·11	0·28

Steam Boat Service.

The saving under this head is due to the ferry service at the Nerbudda break in 1880, which lasted but a few weeks, having cost less than the steam ferry between Bhayndar and Bassim, which was working for three months of 1879.

Special and Miscellaneous Expenditure.

A relatively large saving appears under this head, which compared with 1879 is equivalent to nearly 40 per cent. Particulars are given below :—

Main heads of Abstract G.	1880.	1879.	1880.	
			Increase.	Decrease.
	Rs.	Rs.	Rs.	Rs.
Law charges	1,103	4,597	...	3,494
Compensation	5,198	3,618	1,580	...
Rates and taxes	7,690	8,103	...	413
Payments to other lines	36,421	81,270	...	44,849
Grant in aid of education	7,200	7,200	...	...
Prizes for station gardens	2,877	2,689	188	...
Loss on defaced coins	482	438	44	...
Bombay Port Trust fees	10,976	10,971	5	...
Total ...	71,947	1,18,886	1,817	48,756
			Net decrease in 1880 ...	46,936

More than 90 per cent. of this saving occurs under "Payments to other lines," and is in connection with "Mileage of foreign stock." The decrease in the *imports* of merchandise from other lines, which has already been alluded to, explains this. The large excess of exports over imports has led to a net gain by the Company during the year of Rs. 1,07,779-10-0, the amounts received by it for its wagons run over foreign lines having exceeded by this sum its payments for other Companies' wagons run over its own line. The head "Compensation" would have shown a decrease but for an exceptional payment of Rs. 2,052 in settlement of a liability incurred by the Company between the years 1867 and 1872, consequent on the damage done to the property of a cultivator by the Company's field operations during those years.

The savings under "Law charges" and (excluding the above item) under "Compensation" also are satisfactory, considering the largely increased goods traffic dealt with during the year.

MADRAS.

The following extracts from the Administration Report of the Railway Department in Madras supply all information regarding the two Guaranteed lines in that Presidency.

Hitherto no lines have been constructed by State ageney in Madras.

Proposals have been made during the year for the construction of extensions of the Madras Railway to the Nilgiri Hills and to the port of Cochin. These have been described in Chapter II.

Comparison of work done by Madras and South Indian Railway.—The work done by the two lines in the Madras Presidency during the year compares as follows:—

Madras Railway carried ...	4,010,552 passengers,	average distance of	45·9 miles.
	610,212 tons of goods	,,	108·1 miles.
South Indian Railway ...	4,477,895 passengers	,,	33·3 miles.
	526,379 tons of goods	,,	63·9 miles.

The average bookings per mile of line were—

Madras Railway ... 4,680 passengers and 478 tons of goods, excluding harbour materials.
South Indian Railway 7,008 ,, and 470 ,, ,, ,,

The average contents of a train on the two lines were, supposing all trains to be mixed,—

Madras Railway ...	98·2 passengers	and 35·2 tons of goods.
South Indian Railway ...	124·8 ,,	28·2 ,,

Open mileage.—The open length of this Railway is now taken as 858 miles, of which 815½ miles are single and 42½ miles double line. The increase is due to extensions and to errors discovered by fresh measurements.

Madras Railway.

The line from Bangalore station on the Madras Railway to Bangalore petta, 3 miles in length, constructed by the Mysore Government, was taken over by the Madras Railway Company in October 1880; but, owing to its being exposed to ball practice at the rifle butts, the Agent refused to open the line for traffic till this danger had been removed. The Mysore Government has been addressed regarding the removal of the butts, and it is hoped that a satisfactory solution of the difficulty may soon be arrived at.

The telegraph line on this section has been erected, and will be rented by the Company.

Capital expenditure.—The capital expenditure up to 31st March 1881 was Rs. 11,10,57,028 (£10,180,228), being at the rate of Rs. 1,29,588 (£11,879) per mile. The value of stores in stock on 31st March 1881, including stores in transit (Rs. 61,131), was Rs. 28,55,693.

The total capital expenditure, including stores, was up to the same date Rs. 11,39,12,721 (£10,441,999).

The capital expenditure during the year was Rs. 4,08,852. The principal engineering work on which outlay was incurred were—

	Rs.
Cheyer bridge	32,855
Electrical intercommunication in trains	15,547
Protective works, Muttur bridge	5,856
Extending line to Bangalore petta	1,75,654
Platform and siding, Kistnapuram	14,638
New permanent-way on bridges, north-west line ...	49,077
Pumps to supply water for locomotive purposes ...	26,890
Total	3,20,517

Dividend.—The net profits of the official year were Rs. 19,35,627 (£177,433), giving a dividend at the rate of 1·7 per cent. on the total capital expenditure. The net profits fell short of the guarantee by £345,000.

The guaranteed interest from the formation of the Company up to 31st December 1880 amounted to £9,721,088, and the net profits for the same period to £4,225,821, leaving a balance of £5,495,267 to be met from the revenues of the country, in addition to the expenditure on land and control.

Condition of way and works.—The permanent-way and works have been maintained at the usual high standard on this line.

The embankment between Kadambatur and Arkonam, which slipped in October 1879 and caused a disastrous accident, has been greatly improved. The bank has been thoroughly drained, and good material substituted for the inferior soil previously used. Slight slips occurred in November during heavy rains, causing some delay to trains, but no accident happened. Extra precautions will be taken on this portion of the line during rainy weather. The second line, which was closed in November 1879, was reopened for traffic in June 1880. The monsoon was very heavy in October 1880, but the line throughout stood well, and there was no damage to the permanent-way.

The laying of new permanent-way on girder bridges, and the substitution of iron for wooden sleepers on the west coast, progress steadily. At the end of the year there were only 15½ miles of jungle-wood sleepers remaining.

New works.—Sanction has been accorded to the provision of new girders for the Cauvery bridge, the old material being used for strengthening the bridge over the Papaghni. The cost of the new girders will probably be between £8,000 and £9,000. Estimates, amounting to Rs. 1,24,544, were sanctioned during the year for extensions and for new machinery at Perambur works. These provide for converting the old smithy into a boiler shop and for enlarging the new iron and brass foundries. With the large amount of work now required in the renewal of rolling stock, the additional machinery is much needed.

The new Cheyer bridge, fifty spans of 64 feet, on wrought iron cylinders, was opened for traffic on 1st May 1880; but the bracings for connecting the two cylinders of each pier have yet to be added. Five spans were floored during the year.

Rolling stock.—The future equipment of the line, as regards coaching and goods vehicles was settled, and authority was given for future renewals up to the standard now approved. One hundred (10 tons) iron covered goods wagons were indented for from England. The future equipment of engines for the Madras Railway has not yet been determined.

The Government of Bombay having objected to the use of rivetted tyres in the mail trains on the Great Indian Peninsula Railway, and the Government of India concurring with the Bombay Government in their objection, it was ordered in March 1881 that steps should be taken as soon as possible to remove the rivetted tyres on all the coaching stock on the Madras Railway.

Block system.—The block system is in operation on the line north of Gooty, and works satisfactorily. The train despatching system is still in force on other sections.

Electrical intercommunication in trains.—The work of fitting the whole of the rolling stock with electrical apparatus for intercommunication was by the end of the year practically completed at a cost of Rs. 52,637.

Outstandings of famine traffic.—The outstandings of famine traffic remaining in this year amounted to Rs. 17,076. These outstandings were for freight uncollected on consignments of grain booked to Bellary, which were never taken delivery of by the consignees. These outstandings being irrecoverable were written off in October 1880.

Defects in rolling stock.—These consisted of one case of engine tubes bursting, two cases of axle breaking, and one of fracture of coupling.

Damages to line.—These were all slight, and were due chiefly to heavy local rainfall, and to the bursting of tanks in the vicinity of the line of railway.

Fires in trains.—The damage, except in two cases, was slight. The engines, with but few exceptions, were wood burners; and their spark-arresters and ash-pans are reported to have been in good working order.

Alteration of train service.—This question has again occupied the attention of Government, but no final decision has been arrived at regarding the train service on the Madras Railway. In consequence of the proposed morning departure of steamers from Bombay, an acceleration of the speed of the mail trains between Madras and Bombay was ordered in September 1880; but it was subsequently decided to maintain the present hour of departure, and no alteration was made in the timing of the mail trains.

Rates and fares.—The fare of 2 pies per mile for third class passengers was made general on 1st May 1880, previous to which date the fare by mail train was 4 pies. A reduction was made in the rates for grain. The question of the simplification of the present goods classification has been raised by the Board of Directors, and is now under consideration.

Trial stations.—Seven additional stations were opened during the year:—

	Miles.	
Kistnapuram	166¼	North-west line.
Mangapatnam	205	
Vangnur	219½	
Pennar	234	
Jakalcheru	250	
Minnal	49¾	South-west line.
Kristnarajapuram	210½	Bangalore Branch.

Comparison of earnings and working expenses.—The general results of the last five *calendar* years are compared in the following table:—

Year.	Gross earnings.	Expenditure.	Net revenue.	Percentage of expenses to receipts.	Receipts per open mile per week.
	Rs.	Rs.	Rs.		Rs.
1876	71,13,773	45,79,778	25,33,995	64·38	158·2
1877	1,00,35,295	59,47,402	40,87,893	59·26	224·3
1878	66,30,174	50,42,193	15,87,981	76·05	148·4
1879	66,26,486	45,51,316	20,75,170	68·68	148·3
1880	61,62,546	42,05,409	19,57,137	68·24	137·5

The gross earnings of the year under review are lower than in any year since 1874. Compared with 1879, there is a falling off of about three-fourths of a lakh under coaching traffic, and of nearly four lakhs under goods. The decrease under goods is due to falling off in grain traffic. The working expenses are also lower than in any year since 1874. This result is partly accounted for by a credit of Rs. 93,442 to revenue for 100 harbour wagons; but the expenses also show a steady decrease in almost every item. The expenses include Rs. 97,153 on account of loss by exchange.

The earnings under coaching and goods were—

Year.	Coaching.		Goods.		Total.
	Amount.	Per open mile per week.	Amount.	Per open mile per week.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1876	25,89,492	57·72	42,97,130	95·79	68,86,622
1877	26,99,426	60·33	70,87,341	158·42	97,86,767
1878	27,82,517	62·27	35,69,536	79·88	63,52,053
1879	26,21,195	58·66	37,30,522	83·48	63,51,717
1880	25,45,839	56·85	33,41,731	74·58	58,87,570

The train mileage and earnings per mile were as follow :—

Year.	Mean mileage worked.	Traffic train mileage.	Average number of trains each way per diem over the whole line.	Per traffic train mile.		
				Gross earnings.	Expenses.	Profits.
	Miles.	Miles.	No.	Rs.	Rs.	Rs.
1876	858	2,333,450	3·715	3·048	1·963	1·085
1877	858	3,551,039	5·670	2·826	1·675	1·151
1878	857	2,155,546	3·446	3·076	2·339	0·737
1879	857	2,073,541	3·314	3·196	2·195	1·001
1880	857	1,873,339	2·986	3·290	2·245	1·045

The traffic train mileage has been reduced to the figures of 1872. Compared with 1879, there was a reduction of 9·6 per cent. The decrease is due to goods trains having been run only when required, instead of every day, as formerly; and to the discontinuance of the second passenger train on the Podanur-Beypore section. The earnings per traffic train mile show a decided improvement.

Passenger traffic.—The numbers of passengers (exclusive of troops and police) carried in each class were as follows :—

Year.	First class.	Second class.	Third class.	Fourth or coolie class.	Total.
1876	12,486	32,747	1,735,411	973,872	2,761,516
1877	13,090	37,224	1,707,836	810,046	2,568,196
1878	13,737	41,275	2,144,997	440,612	2,640,621
1879	10,836	35,213	2,586,987	645,750	3,278,786
1880	10,970	34,566	3,907,487	...	3,953,023

The receipts from each class were—

Year.	First class.	Second class.	Third class.	Fourth or coolie class.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.
1876	1,53,216	1,27,980	14,58,189	4,22,545	21,61,930
1877	1,58,513	1,27,018	15,18,083	3,62,441	21,66,055
1878	1,62,532	1,37,991	17,05,894	1,82,473	21,88,890
1879	1,40,875	1,15,472	15,63,793	2,65,730	20,85,870
1880	1,44,662	1,11,770	18,01,248	...	20,57,680

The percentages of numbers and receipts were—

Year.	Numbers.				Receipts.			
	First class.	Second class.	Third class.	Fourth class.	First class.	Second class.	Third class.	Fourth class.
1876	0·45	1·44	62·84	35·27	7·09	5·92	67·44	19·55
1877	0·51	1·45	66·50	31·54	7·32	5·86	70·09	16·73
1878	0·52	1·56	81·23	16·69	7·43	6·30	77·93	8·34
1879	0·33	1·07	78·90	19·70	6·75	5·54	74·97	12·74
1880	0·28	0·87	98·85	...	7·03	5·43	87·54	...

Before comparing these figures, it will be well to review the changes in the train service and fares for the third class. From 1st July 1879 to 30th April 1880, the third class fare by all except mail trains was 2 pies. On 1st May 1880, the 2 pie fare was extended to mail trains. The effect of this reduction of the third class fare by mail trains has been a large increase in the number of third class passengers. This was most marked on the Bangalore and Nilgiri branches, and between Nancherla and Raichur. There were also small increases on the other sections of the line. The development in numbers reached 21 per cent. over the figures for the previous year, but the receipts show a small decrease. Owing to the above concession, the issue of third class return tickets at a fare and a half was discontinued from 1st May 1880.

The other items of coaching traffic are compared in the following table:—

Year.	Troops and police, including military baggage and horses.	Passengers' luggage.	Carriages, horses, &c.	Parcels.	Special trains.
	Rs.	Rs.	Rs.	Rs.	Rs.
1876	1,34,684	45,328	84,400	1,23,974	35,994
1877	1,84,670	88,358	87,420	1,24,836	45,321
1878	2,95,755	80,244	86,692	1,15,415	11,727
1879	2,74,512	74,453	70,779	95,477	14,930
1880	2,37,121	76,816	64,726	92,936	13,141

The receipts from troops during the year under review were somewhat less than those of the previous year. The new parcels traffic, under which the charges are irrespective of distance, requires more time for development.

Goods traffic.—The receipts from each class of goods were—

Classes.	1876.	1877.	1878.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.
Special	16,85,200	50,50,397	15,16,277	16,25,527	10,37,459
First class	13,27,109	9,51,017	8,99,950	9,07,167	9,93,997
Second „	5,51,608	5,84,931	5,41,246	5,97,619	6,82,741
Third „	3,51,938	1,97,422	2,65,683	3,15,801	3,08,428
Fourth „	1,33,502	98,527	99,458	1,02,216	91,787
Fifth „	88,000	34,291	51,198	51,193	61,122
Total ...	41,37,357	69,16,585	33,73,812	36,07,523	31,75,534

The tonnage of goods in each class was—

Classes.	1876.	1877.	1878.	1879.	1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Special	376,096	796,160	340,804	440,705	379,333
First class	148,956	120,141	116,274	119,055	136,450
Second „	49,052	50,281	47,524	55,480	62,251
Third „	24,621	13,233	17,791	22,669	20,805
Fourth „	5,745	3,832	4,153	4,439	4,532
Fifth „	4,901	981	2,986	2,143	2,351
Total ...	609,371	984,628	528,532	644,491	605,722

The average receipts per ton per mile from each class were—

Classes.	1876.	1877.	1878.	1879.	1880.
	Pies.	Pies.	Pies.	Pies.	Pies.
Special	7·72	7·65	7·52	7·28	7·12
First class	10·00	9·47	9·53	9·31	8·87
Second „	12·43	12·35	12·50	12·68	12·53
Third „	16·49	17·00	16·39	16·04	16·32
Fourth „	21·56	21·79	21·36	22·91	22·11
Fifth „	30·29	33·45	25·94	27·84	26·17
Total ...	9·75	8·38	9·31	9·15	9·41

The tonnage of and receipts from goods are far below those of the previous year, owing to the falling off in grain traffic, and to the reduced rates at which grain is now carried. On 19th July 1880, the rates for grain and seeds by goods train in consignments of not less than 10 tons were reduced to 6 pies per ton per mile for distances not less than 50 miles, and to 5 pies per ton per mile for distances not less than 250 mile; but these rates have not moved trade, there being a great absence of demand for grain. There was a great decrease in the quantity of grain sent from North Arcot to Beypore, which was formerly a paying traffic; and grain is now imported into the Malabar district from Calcutta and other ports.

Excluding other harbour materials, the figures for the last two years compare thus :—

	Tons.	Receipts. Rs.
1879	471,343	35,46,423
1880	410,041	30,96,305

Principal commodities.—The receipts from the chief commodities carried are shown in the following table :—

Articles.	1876.	1877.	1878.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.
Betel nuts	68,416	49,737	55,810	65,698	64,699
Chillies	25,947	31,317	25,789	44,287	48,273
Clothes and piece-goods	1,08,418	80,099	87,751	88,431	97,010
Coffee	69,379	43,015	51,326	52,489	51,262
Commissariat stores	70,204	66,904	71,631	46,058	52,226
Cotton	3,79,404	33,617	1,84,341	2,30,109	2,41,309
Firewood	32,143	23,917	43,206	39,723	40,725
Fruits and vegetables	40,132	46,315	48,528	55,899	47,368
Ghee	18,192	13,803	16,673	45,997	26,727
Government telegraph materials	...	...	...	...	...
Gram	2,68,440	3,22,672	1,35,854	1,64,581	2,00,728
Grains	2,07,484	33,50,477	6,39,543	3,49,256	58,324
Gunnies	44,277	63,037	35,850	35,212	33,299
Harbour materials	36,454	12,315	27,171	61,098	79,237
Indigo	13,826	6,437	14,275	27,523	13,734
Iron of all kinds	1,16,794	1,04,882	68,088	76,745	1,65,065
Jagri	41,036	39,071	32,775	55,348	59,271
Luggage	26,415	26,965	32,405	28,771	29,865
Oil of all kinds	60,234	40,641	36,525	55,991	49,725
Ordnance stores	42,924	47,335	68,391	20,886	24,078
Paddy	75,204	1,10,953	52,619	63,677	24,967
Potatoes	22,896	20,179	21,284	36,853	24,373
Ragi	1,39,983	1,24,057	80,289	1,68,911	66,466
Rice	6,86,799	7,39,030	2,35,038	3,43,886	2,02,580
Salt	3,92,480	4,44,252	3,60,396	3,52,542	3,76,306
Salt-fish	20,615	41,125	25,386	22,633	25,959
Seeds of all kinds	1,31,664	34,541	1,15,844	1,34,463	1,05,790
Skins	2,29,606	2,18,234	1,46,232	1,53,931	1,62,486
Sugar of all kinds	36,072	29,228	23,440	28,238	36,794
Sundries	4,04,550	4,74,593	3,89,277	3,42,007	3,01,870
Tamarind	46,117	26,131	41,730	73,281	52,534
Timber	87,614	62,031	64,417	68,146	64,866
Tobacco	35,879	32,214	22,505	31,353	32,251
Twist	77,934	51,126	53,039	57,576	62,021
Wines and spirituous liquors	49,226	49,108	51,161	47,410	40,920
Total ...	41,06,758	68,59,358	33,68,589	34,69,009	29,63,108

Grain traffic.—The total quant ity of foodgrains carried was 110,584 tons, yielding a receipt of Rs. 5,53,064, compared with 186,982 tons, yielding Rs. 10,90,310, in the preceding year. Improvement is still shown in the tonnage of some other items of goods traffic.

Cotton traffic.—The following table shows the number of tons of cotton carried, the total receipts, and the average receipts per ton during the last five years :—

Year.	Half pressed.	Full pressed.	Loose.	Total.		Avera e receipts per ton.
	Tons.	Tons.	Tons.	Tons.	Rs.	Rs.
1876	11	18,503	4,962	23,476	3,79,404	16·16
1877	...	1,047	635	1,682	33,618	19·98
1878	3	8,960	2,782	11,745	1,84,346	15·69
1879	1	12,003	4,172	16,176	2,29,115	14·16
1880	...	11,384	4,377	15,761	2,30,439	14·62

In 1880, the cotton was contributed chiefly by the following districts :—

Bellary, 10,814 tons ; Coimbatore, 2,080 tons ; Cuddapah, 1,742 tons; and was distributed as follows :—Madras, 9,839 tons; Bombay, 3,654 tons; Beypore, 748 tons; and cotton pressing stations, 1,056 tons. The quantity of cotton exported from Madras was 6,730 tons.

Salt traffic.—The following table gives the tonnage of salt traffic out of Madras and from all stations :—

	1876.	1877.	1878.	1879.	1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
South-West line	41,638	45,661	36,741	32,933	36,211
North-West line	5,339	8,225	6,745	9,854	11,284
Total from Madras ...	46,977	53,886	43,486	42,787	47,495
Grand total from all stations ...	51,470	58,609	48,912	48,018	51,195

Compared with 1879, the tonnage out of Madras shows an increase, especially on the South-West line.

The work done in coaching and goods transport is shown in the following table :—

Year.	Passengers.				Goods.			
	Number of passengers	Average mileage.	Total unit mileage.	Passenger miles per mean mile worked.	Tonnage of goods.	Average mileage.	Total ton mileage.	Goods ton miles per mean mile worked.
1876 ...	2,798,129	51·2	143,195,738	166,895	615,038	135·0	83,026,930	96,768
1877 ...	2,628,499	53·5	140,547,066	163,808	990,666	161·4	159,902,322	186,366
1878 ...	2,716,040	52·4	142,389,181	166,148	542,528	131·3	71,261,199	83,152
1879 ...	3,344,857	47·3	158,398,392	184,829	647,408	118·1	76,461,018	89,219
1880 ...	4,010,552	45·9	184,052,220	214,763	610,212	108·1	65,990,330	77,002

The traffic interchanged with the Great Indian Peninsula Railway is shown in the following table :—

Year.	Passengers.		Goods.	
	Number.	Receipts.	Tons.	Receipts.
		Rs.		Rs.
1876	9,224	68,272	62,759	5,80,157
1877	15,614	1,08,713	139,184	8,07,854
1878	14,139	1,10,014	32,659	3,84,514
1879	19,441	1,46,697	63,734	6,52,230
1880	18,064	1,34,511	36,355	4,19,393

Working expenses.—The maintenance and locomotive charges compare as follows with previous years :—

Year.	Expenses.					
	Maintenance of way, works and stations.			Locomotive.		
	Amount.	Mean miles maintained from Revenue funds.	Per mean mile maintained.	Amount.	Per traffic train mile.	Per engine mile.
	Rs.	Miles.	Rs.	Rs.	As.	As.
1876	13,74,191	858	1,602	16,22,563	11·126	8·389
1877	12,09,548	858	1,410	21,56,704	9·718	7·426
1878	12,64,737	857	1,476	16,77,206	12·449	8·633
1879	13,13,030	857	1,532	15,96,837	12·322	8·602
1880	12,42,825	857	1,450	13,99,791	11·955	9·886

Maintenance.—During 1880 the cost of maintenance averaged Rs. 1,248 per mile of track, including sidings, or Rs. 1,450 per open mile.

The following items of extraordinary expenditure are included in these figures :—

	Rs.
New permanent-way on bridges	46,711
Renewals with iron sleepers	1,61,264
Total ...	2,07,975

The decrease under this head is due to the fact that the expenditure for 1879 included an item of Rs. 42,269 for the reconstruction of the Cheyer bridge, whereas revenue expenditure on this work ceased from 1st January 1880. The expenditure on renewals with iron sleepers will continue for another year, and that on new permanent-way on bridges for some years to come. Heavy outlay must be expected in future years on account of renewals of rails.

Locomotive.—The amount spent on repairs of locomotives was smaller than in any year since 1874. During the year under review 75 engines were repaired; the average number in the shops being 30. The new smithy, boiler shop, and other conveniences which have been sanctioned were not brought into use during the official year. The cost of fuel and water has greatly decreased compared with figures of previous years, and nearly all other items under this head show a decrease.

The expenditure in other departments is shown in the following table :—

Year.	Expenses.					
	Carriage and Wagon.		Traffic.		General charges.	Miscellaneous.
	Amount.	Per 1,000 vehicle miles.	Amount.	Per traffic train mile.	Amount.	Amount.
	Rs.	Rs.	Rs.	As.	Rs.	Rs.
1876	3,93,135	11·086	6,65,182	4·561	4,50,192	74,605
1877	7,00,983	14·161	8,17,358	3·683	4,31,797	6,31,011
1878	6,29,227	18·765	8,34,952	6·198	4,54,453	1,81,612
1879	3,66,609	10·638	7,13,688	5·507	4,53,681	1,07,479
1880	3,21,457	10·357	6,60,139	5·638	4,37,687	1,43,510

The *carriage and wagon* expenses show a small decrease. During 1880 there were 40 vehicles renewed and 3,603 repaired. The expenditure on oil was less than in any previous year. A saving occurs also under labor employed in cleaning carriages.

The *traffic* expenses show a considerable decrease, and further reductions are being made.

The expenditure under *general charges* shows a slight decrease.

The increase under *special and miscellaneous* occurs chiefly under law charges and compensation, due to claims settled for short delivery of grain, &c., during the famine, and to the passengers who suffered by the Chinnammapet accident.

South Indian Railway.

Open mileage.—At the commencement of the official year the total length of line opened for traffic was 632¼ miles.

During the year the following sections were opened—

On 1st August 1880, Chingleput to Walajabad	...	13 miles
On 1st January 1881, Walajabad to Conjeveram	...	8 miles

making the total length open at the end of the official year 653¼ miles. To this length the Pondicherry Railway (from Gingee river to Pondicherry), 7¾ miles, has to be added, making the total length worked by the Company at the end of the official year 661 miles.

The opening of the line from Chingleput to Conjeveram completes the South Indian Railway system, and connects this line with the Madras Railway at Arconum, thus enabling traffic exchanged with the Madras Railway to be carried by a direct route instead of going round by Madras, a saving of 38 miles.

Capital expenditure.—The capital expenditure on the open line up to March 1881 was Rs. 4,19,87,129 (£4,023,767), being at the rate of Rs. 64,289 (£6,161) per mile.

The value of stores in stock on 31st March 1881 was Rs. 27,91,767. The total capital expenditure, including line under construction and stores, was Rs. 4,47,78,896 (£4,291,311).

The capital expenditure during the year was Rs. 12,42,707. There was no abnormal expenditure, but the following credit was brought to account,

Depreciation of 3′ 6″ stock charged to revenue in December 1880, Rs. 50,000.

The total expenditure on the southern extensions up to 31st December 1879 amounted to Rs. 1,14,18,778, which for a length of 215¼ miles gives a rate of Rs. 53,049 per mile. The cost of the northern extension for the same period amounted to Rs. 1,39,13,195, the rate per mile being Rs. 63,822.

Dividend.—The net profits of the official year were Rs. 12,98,007, being at the rate of 2·9 per cent. on the total capital expenditure. The net profits fell short of the guaranteed interest by about £115,000.

The guaranteed interest, from the formation of the Company up to 31st December 1880, amounted to £2,410,757; and the net profits for the same period to £968,518, leaving a balance of £1,442,239 to be met from the revenues of the country, in addition to the expenditure on land and control.

Work sanctioned during the year.—The following are the principal capital works sanctioned during the year :—

Engineering Department.

	Rs.
Trichinopoly Junction water-supply	24,212
Siding to Mount Capper quarry	10,297
Substitution of iron for wooden sleepers on Trichinopoly-Erode section	11,996
Protective works, northern extension	69,026
Completion of Porto Novo-Coleroon section	67,881
Flooring and pitching Gunnecherry bridge	21,980
Covered loading bank at Egmore	12,490
Egmore new station building	24,318
Siding to Kolatur quarry	9,740
Alteration and additions at Arconum	39,019
Flooring Chittar bridge	9,151

Locomotive Department.

Alterations and additions to locomotive workshops at Negapatam	21,351
Engine shed at Chingleput	26,678

Condition of way and works.—The line is in good order throughout. The quality of ballast has in many places been improved, and the light sand between Cuddalore and Tanjore is being coated with laterite gravel obtained near Cuddalore. All points and crossings are being relaid with teak sleepers, as well as a few of the curves on the main line.

The superstructure of bridges is in good order, and floors are being added to all works in the Tanjore delta and to others which are not founded on rock, or which show signs of scour.

The iron bowls which were obtained for use in the conversion of gauge are being substituted for wooden sleepers between Trichinopoly and Negapatam. The vegetable fencing, though making fair progress, is not yet efficient on some portions of the line. Wire has been supplied where it is evident that a vegetable fence cannot be grown.

The bridge over the Gingee river (Pondicherry Railway), consisting of seven openings of 150 feet, is still under construction. The girders are of the Whipple-Murphy type, and are similar to those in the other large bridges on the South Indian Railway, except that the struts are braced with lattice bars instead of plates. The temporary way was destroyed by floods and work at the bridge generally delayed in November 1880. A thoroughly effective flooring is being put in. The bridge will shortly be opened for traffic.

On the Chingleput-Conjeveram line the bridge of two 120 feet openings near Chingleput is still in progress, but will be completed by the end of 1881. The line to the Madras Beach, for which gates and fencing were sanctioned with a view to an increase of speed for the local trains, was not up to the required standard at the end of the official year, the permanent-way requiring considerable improvement. To ensure safety and convenience in working, a system of electric bells is being supplied at the various gates.

Stations.—The following additional stations were opened during the year :—

Padalam
Walajabad
Villiambakam } on the Chingleput-Conjeveram line.
Sivarem

The new stations at Conjeveram and Arconum are in progress, as also the goods shed at the former place. The overbridge at Arconum will be extended across the South Indian Railway for convenience of passengers, and the platform lengthened to 700 feet. The old station at Conjeveram has been abandoned, and the new one is being constructed in a more convenient situation. Estimates for providing two distant signals at each station from Negapatam to Erode were submitted for sanction during the year.

Water-supply.—The arrangements for supplying Trichinopoly Junction with water from Wyacondan channel are complete, and a reservoir has been constructed near the station, into which surplus water from the tank-house finds its way. The contents of this reservoir are calculated to meet all demands during the season when the bed of the Wyacondan is dry.

The water obtained from the Vaippar river for Satur has been analysed, and found unfit for use in locomotives.

At Tuticorin pipes have been laid from a well about three-quarters of a mile distant, and the use of tank trucks has been discontinued here as well as at Trichinopoly.

Owing, however, to the bad quality of the water at Maniyachi, Kadumbar, and Satur, water-trucks have to be continued in the trains between Madura and Tuticorin.

At Cuddalore no satisfactory supply of water has yet been obtained. The damage to boilers from the water used at this station would justify considerable capital expenditure in obtaining a supply of good quality, and the subject is now being again considered.

Rolling stock.—The total stock sanctioned includes 36 coaching and 20 goods vehicles converted from 3 feet 6 inches gauge.

Out of 323 third class carriages sanctioned, 284 have been completed ; and of 825 covered goods wagons, 787 have been finished.

The following stock was completed during the year :—

64 coaching vehicles.
18 goods vehicles.

It has been decided to erect workshops at Cuddalore old town, and additional accommodation is being provided at Negapatam.

Transfer of head-quarters to Trichinopoly.—Nothing further has been done regarding this proposal, but provision was made in the budget of 1881 for the new offices at Trichinopoly.

Defects in rolling stock.—These were chiefly failures of springs of engines, fracture of couplings from defective metal, faulty workmanship, and wear and tear.

Damages to line.—These were caused by heavy local rainfall and floods in streams crossed by the line. Most of these that occurred during the north-east monsoon were of a serious nature, and caused interruption of traffic for considerable periods.

Breaches in the line.—On the 20th and 21st November 1880 a severe cyclone swept over the country traversed by the South Indian Railway in the Chingleput, South Arcot, Tanjore, and Trichinopoly districts, its effects being felt most about Negapatam. This storm resulted in serious damage to the line. In the 97th mile there were seven breaches aggregating 316 lineal feet, and further damages occurred at mileages 105 (Pondicherry Branch), 168, 169, 186, 215, 231, 235, 305, 408, 444.

Traffic was interrupted at the 9th mile for ten days, and at the 215th mile for three weeks. Night traffic was also suspended for some time.

At 168-1 a 6-feet girder was entirely washed away, the line being breached for a length of 33 yards. Four 25-feet girders will be erected here.

The damages at 214-2 and 214-6 were due to the breaching of the banks of the Vennar river. The abutments of two bridges were damaged, and are being rebuilt. At 230-11 a bridge of three 12-feet arches was washed away by the breaching of tanks. Two 25-feet openings are being substituted here. At 234-4 one abutment of a bridge failed, and is being rebuilt. Estimates to the extent of Rs. 30,949 for repairing damages to existing masonry works and for providing 133 lineal feet of additional waterway have been sanctioned, and the work is in progress.

The temporary line across the bed of the Gingee river was damaged, and traffic with Pondicherry interrupted for about three weeks.

Train service.—No change was made in the mail train service introduced on 1st January 1880.

The local train which formerly halted at Cuddalore, Trichinopoly, and Madura has since 1st August 1880 halted at Chingleput, Mayavaram, and Madura, this service being better calculated to meet the wants of the populous district of Tanjore. On the same date a third train was introduced on the Negapatam Branch, so as to provide through connection with all trains at Tanjore.

A through train was introduced on 1st January 1881 between Madras and Arconum *viâ* Conjeveram.

Rates and fares.—A change in fares is contemplated, but they remained during 1880-81 the same as noted in the Administration Report for the previous year. Owing to competition, it has been found necessary to reduce goods rates, and in some cases they are now so low as to be barely remunerative. This line has the disadvantage of following the coast, and it is from internal development that an increase of traffic must be looked for; cheap inland feeders are much wanted.

Comparison of earnings and working expenses.—The general results for the last five calendar years are compared in the following table :—

Year.	Gross earnings.	Expenditure.	Net revenue.	Percentage of expenses to receipts.	Receipts per open mile per week.
	Rs.	Rs.	Rs.		
1876	19,90,800	10,60,522	9,30,278	53·27	89·8
1877	32,33,246	16,45,026	15,88,220	50·88	106·9
1878	32,33,140	21,55,033	10,78,107	66·65	102·2
1879	33,62,067	22,98,815	10,63,252	68·37	104·8
1880	35,59,594	26,29,576	9,30,018	73·87	105·8

The total receipts show an improvement, but the traffic of this Railway still continues small.

The following sums are included in the working expenses :—

	Rs.
Depreciation of locomotive and carriage and wagon stock transferred to Dhond and Manmad Railway	4,07,279
Depreciation of 3 feet 6 inches gauge stock of the Arconum-Conjeveram Section to metre gauge	50,000
Total ...	4,57,279

Excluding the above abnormal expenditure, the percentage of expenses to receipts is 61.

The earnings under coaching and goods were as follow :—

Year.	Coaching.		Goods.		Total.
	Amount.	Per open mile per week.	Amount.	Per open mile per week.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1876	11,83,325	53·38	7,18,132	32·39	19,01,457
1877	15,96,193	52·78	15,14,783	50·09	31,10,976
1878	19,06,087	60·22	12,26,495	38·75	31,32,582
1879	20,03,022	62·46	13,09,593	40·84	33,12,615
1880	20,62,513	1·30	14,45,911	42·98	35,08,424

It will be seen that the coaching receipts of this year are almost identical with those of the preceding one. In spite of the great falling off in grain traffic, the earnings under goods show some improvement.

The train mileage and earnings per mile compare as follows :—

Year.	Mean mileage worked.	Traffic train mileage.	Average number of trains each way per diem over the whole line.	Per traffic train mile.		
				Gross earnings.	Expenditure.	Profits.
	Miles.	Miles.	No.	Rs.	Rs.	Rs.
1876	424	596,540	1·922	3·337	1·778	1·559
1877	580	1,136,374	2·684	2·846	1·448	1·398
1878	607	1,174,309	2·650	2·753	1·836	0·917
1879	615	1,161,153	2·586	2·895	1·980	0·915
1880	639	1,190,018	2·526	2·991	2·210	0·781

The increase in the expenditure per traffic train mile is due to the abnormal expenditure previously mentioned.

Passenger traffic.—The number of passengers (exclusive of troops and police) carried in each class were as follows :—

Year.	First class.	Second class.	Third class.	Total.
1876	8,483	67,820	2,732,806	2,809,109
1877	11,738	130,161	3,868,491	40,10,390
1878	15,191	125,994	4,855,592	4,996,777
1879	17,071	106,859	5,056,933	5,180,863
1880	7,709	40,853	4,402,908	4,451,470

The receipts from each class were—

Year.	First class.	Second class.	Third class.	Total.
	Rs.	Rs.	Rs.	Rs.
1876	18,936	37,277	10,62,932	11,19,165
1877	23,007	68,145	14,06,991	14,98,143
1878	29,116	70,409	17,05,974	18,05,499
1879	33,760	64,404	17,88,485	18,86,649
1880	43,767	54,175	18,58,437	19,56,379

The percentages of numbers and receipts work out thus :—

Year.	Number.			Receipts.		
	First.	Second.	Third.	First.	Second.	Third.
1876	0·30	2·41	97·29	1·69	3·33	94·98
1877	0·29	3·24	96·47	1·54	4·55	93·91
1878	0·30	2·52	97·18	1·61	3·90	94·49
1879	0·33	2·06	97·61	1·79	3·41	94·80
1880	0·17	0·92	98·91	2·24	2·77	94·99

The increase in fares noted in the last Administration Report has resulted in a falling off in the number of passengers of all classes. The receipts show an increase in the first class, but a decrease in the second; the total of these two classes taken together being about the same as in the preceding year. Notwithstanding the loss of traffic in consequence of flood damages, the third class shows an improvement, but it is difficult to ascertain how far this is due to the increased mileage worked and to the effect of the through train service.

The other items of coaching traffic compare thus :—

Year.	Troops and police, including military baggage and horses.	Passengers' luggage.	Carriages, horses, &c.	Parcels.	Special trains.
	Rs.	Rs.	Rs.	Rs.	Rs.
1876	8,294	8,571	11,461	31,065	4,508
1877	24,123	15,043	13,238	38,813	6,397
1878	20,593	22,205	16,386	36,245	4,543
1879	35,717	25,914	15,707	35,402	2,458
1880	19,230	27,907	14,563	37,065	6,412

The falling off under troops and police is due to the fact that fewer troops are now stationed in the southern parts of this Presidency.

Goods traffic.—The receipts from each class of goods were—

Classes.	1876.	1877.	1878.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.
Special	3,75,490	13,27,162	10,52,160	11,44,084	12,91,506
First class	2,91,453	1,28,561	1,04,729	81,670	50,252
Second „	.....	.....	.....	.....	.....
Third „	.....	.....	.....	.....	.....
Fourth „	15,948	17,964	21,877	29,425	22,841
Fifth „	2,829	5,663	9,977	19,387	1,211
Total ...	6,85,720	14,79,350	11,88,743	12,74,566	13,65,810

The tonnage of goods in each class was as follows :—

Classes.	1876.	1877.	1878.	1879.	1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Special	116,456	335,755	350,340	421,447	503,635
First class	64,103	37,857	15,689	13,977	7,775
Second „	.....	.....	.....	.....	.....
Third „	.....	.....	.....	.....	.....
Fourth „	1,649	1,502	2,565	3,740	1,824
Fifth „	106	126	738	1,299	32
Total ...	182,134	375,240	369,332	440,463	513,266

The average receipts per ton per mile in each class were—

Classes.	1876.	1877.	1878.	1879.	1880.
	Pies.	Pies.	Pies.	Pies.	Pies.
Special	8·162	8·083	8·515	8·130	7·866
First class	11·749	11·869	11·793	11·858	11·905
Second „	.....	.....	.....	.....	.....
Third „	.....	.....	.....	.....	.....
Fourth „	22·439	23·920	23·609	23·614	23·870
Fifth „	52·571	53·618	52·193	53·046	48·571
Total ...	9·581	8·410	8·900	8·542	8·063

The increase in tonnage is due chiefly to the larger quantity of harbour materials, excluding which traffic the figures for the last three years compare as follows :—

Year.	Ordinary goods.		Harbour material.	
	Tonnage.	Receipts.	Tonnage.	Receipts.
		Rs.		Rs.
1878	281,027	11,40,338	88,305	48,405
1879	271,041	11,87,907	169,422	86,659
1880	300,511	12,60,785	212,755	1,05,025

The tonnage and receipts show a satisfactory increase. The average lead of ordinary goods in the two years was 95 and 97 miles, and the average receipts per ton mile 8·81 and 8·36 pies respectively.

The receipts from the chief commodities carried compare thus :—

	1876.	1877.	1878.	1879.	1880.
	Rs.	Rs.	Rs.	Rs.	Rs.
Areca nuts	13,569	9,863	13,670	13,448	18,338
Cloth	26,982	18,092	23,069	31,066	52,453
Cotton	5,297	6,972	19,826	26,620	37,456
Curry-stuff	40,993	26,773	35,791	45,383	52,855
Fruit and vegetables	10,476	12,864	19,794	28,275	39,825
Grains of all kinds	2,22,426	9,97,070	5,44,707	5,28,752	3,64,279
Granite stones	23,985	14,475	21,979	16,798	25,379
Hides	9,317	12,038	12,495	12,915	19,909
Jagri	...	...	...	...	81,141
Oil and ghee	19,705	9,506	18,792	33,651	30,844
Oil cakes	27,918	20,537	23,076	19,139	26,530
Salt	66,135	71,196	58,481	63,093	72,827
Seeds of all kinds	60,364	37,788	87,002	67,424	73,237
Sundries	...	...	...	...	6
Tea	1,60,173	2,22,175	2,56,301	2,95,246	3,55,917
Tobacco	5,509	7,559	8,633	8,880	11,344
Stone for Madras Harbour Works ...	...	18,124	48,405	86,659	1,05,025
Total ...	6,92,851	14,85,032	11,92,021	12,77,349	13,67,365

There was a large falling off in the receipts from grain, but other items of traffic show general improvement.

The work done by the Railway in transporting passengers and goods is shown in the following table :—

Year.	Passengers.				Goods.			
	Number of passengers.	Average mileage.	Total unit mileage.	Passenger miles per mean mile worked.	Tonnage of goods.	Average mileage.	Total ton mileage.	Goods ton miles per mean mile worked.
1876	2,821,375	36·40	102,698,914	242,214	199,599	75·45	14,540,964	34,295
1877	4,048,095	37·89	153,388,313	264,463	387,052	89·49	34,636,940	69,719
1878	5,030,434	35·40	178,071,622	293,363	385,195	69·34	26,708,420	44,001
1879	5,215,043	34·41	179,441,151	291,774	455,209	65·34	29,743,487	48,363
1880	4,477,895	33·30	149,111,679	233,351	526,379	63·94	33,657,752	52,672

Working expenses.—The maintenance and locomotive charges compare as follows with previous years :—

Year.	Maintenance of way, works and stations.			Locomotive expenses.	
	Amount.	Mean miles maintained from Revenue funds.	Cost per mean mile maintained from Revenue funds.	Amount.	Per traffic train mile.
	Rs.	Miles.	Rs.	Rs.	As.
1876	74,204	185	401	4,94,817	13·272
1877	1,79,287	217	826	7,53,062	10·612
1878	4,81,912	424	1,137	8,59,989	11·717
1879	5,25,825	580	907	7,85,944	10·830
1880	5,72,197	607	943	10,67,851	14·358

Maintenance.—The increase in expenditure under this head over the preceding year occurs chiefly under permanent-way materials. There is a decrease under general superintendence, although it includes abnormal expenditure, Rs. 8,217, on account of bonuses paid to two engineers on reduction of establishment. The extraordinary expenditure amounted to Rs. 14,437.

Locomotive.—The large increase under this head is due to depreciation of locomotive stock amounting to Rs. 2,59,720. The remaining expenses under this head also show an increase, due to additional train mileage.

The consumption of coal per train mile is compared in the following statement :—

Year.	Total train miles.	Lbs. of coal per total train mile.	Engine miles.	Lbs. of coal per engine mile.	Percentage of engine mileage in excess of total train mileage.
1876	622,808	37·14	821,749	28·15	31·94
1877	1,165,098	39·63	1,616,907	28·55	38·78
1878	1,228,157	38·68	1,617,581	29·37	31·71
1879	1,250,561	34·62	1,713,171	25·27	36·99
1880	1,297,067	32·06	1,624,606	25·60	25·25

The figures for last year compare favorably with those of preceding years.

The expenditure in other departments is compared in the following table :—

Year.	Carriage and Wagon expenses.		Traffic expenses.		General charges.	Special and miscellaneous expenditure.
	Amount.	Per 1,000 vehicle miles.	Amount.	Per traffic train mile.	Amount.	Amount.
	Rs.	Rs.	Rs.	As.	Rs.	Rs.
1876	1,91,798	17·168	1,68,004	4·506	93,506	38,193
1877	1,31,154	6·285	2,75,617	3·881	1,59,686	1,46,220
1878	1,21,307	5·540	2,85,744	3·393	2,46,214	1,59,876
1879	3,68,143	15·920	3,10,735	4·282	2,48,016	60,152
1880	3,56,492	15·342	3,40,692	4·581	2,75,844	16,500

The *carriage and wagon* expenses include a debit of Rs. 1,97,558 for depreciation of wagon stock transferred to Dhond and Manmad State Railway.

The *traffic* expenses show an increase, due to the introduction of the night train service from 1st January 1880, to the opening of new stations, and to enhanced salaries.

The excess under *general charges* is due to an increase in the Agency and Audit Departments, and to a larger proportion of salaries being now charged to revenue. Also to increased expenditure under electric telegraph signallers and office expenses, chiefly due to night train service.

The large decrease under *special and miscellaneous* is due to absence of charges for hire of locomotives, mileage of foreign stock, and rent of joint stations.

The amount received for working the Pondicherry Railway amounted to Rs. 12,751.

CHAPTER V.

ADMINISTRATION OF RAILWAYS IN INDIA—INDIAN COAL—REVIEW OF FINE FUNDS.

Administration of Guaranteed Railways and of State Railways—State Railways classed as Imperial, Provincial, and Native States—Principal administrative orders passed during the year.

Coal worked in Bengal and Central Provinces—Coal exists in Madras, Assam, and the Punjab—English coal undersells Indian coal in Madras and Sind—Distribution of coal over the Great Indian Peninsula Railway.

Fine Funds—Tabulated statement of—

ADMINISTRATION OF RAILWAYS IN INDIA.

Administration of Guaranteed Railways and of State Railways.

THE whole system of Railways in India is under the control of the Indian Government.

In return for the State aid afforded to the old Guaranteed Companies, the Indian Government exercises this control over each Company by means of officers termed "Consulting Engineers to Government," posted at Bombay for the Great Indian Peninsula and Bombay, Baroda and Central India Railways; at Madras for the Madras and South Indian Railways; at Calcutta for the East Indian and Eastern Bengal Railways; at Lahore for the Sind, Punjab and Delhi Railway; and at Lucknow for the Oudh and Rohilkhand Railway. The Consulting Engineers at Madras and Bombay are under the orders of the Governments of those two Presidencies; those at Calcutta, Lucknow, and Lahore are under the immediate orders of the Government of India. This disposes of the Guaranteed lines. State Railways are classed under three heads:—

State Railways classed as Imperial, Provincial, and Native States.

I. Imperial.
II. Provincial.
III. Native States.

Imperial Railways are constructed from Imperial funds, and will be generally under the control of the Director General of Railways.

Provincial Railways are constructed from funds for the interest on which the Provincial Government has accepted all responsibility. These are controlled by the Local Governments and Administrations, under the general supervision of the Government of India.

Class III comprises those lines which have been constructed on the financial responsibility of the Native rulers in whose territory they lie. These are in most cases controlled by the Consulting Engineers to Government.

At the close of March 1881 the various State Railways were administered as follows, the Director General of Railways exercising a general control over all the lines:—

PUNJAB AND SIND—

Lines opened for traffic. Under the Consulting Engineer to the Government of India for Guaranteed Railways, Punjab.

Lines under construction. Engineers-in-Chief responsible directly to the Director General of Railways.

BOMBAY AND CENTRAL INDIA—

Rajputana Railway, Holkar and Sindia-Neemuch Railways, and Neemuch-Nasirabad Railway. Under Consulting Engineer to the Government of Bombay for Railways, both open line and line under construction.

Sindia Railway. Open line worked by East Indian Railway Management, and controlled by Consulting Engineer to the Government of India for Guaranteed Railways, Calcutta. Line under construction—Engineer-in-Chief, under orders of Director General of Railways.

BENGAL—

Bengal system of State Railways. Under Bengal Government, which Administration accepts financial responsibility.

Dhond and Manmad Railway. Under Great Indian Peninsula Railway Management, and controlled by the Consulting Engineer to Government of Bombay for Railways.

Patri Branch. Under Bombay, Baroda and Central India Railway Management, and controlled by the Consulting Engineer to Government of Bombay for Railways.

Rajputana and Central India system. (See above.)

NORTH-WESTERN PROVINCES AND OUDH—

Provincial State Railways within the Province. Under Local Government, which accepts financial responsibility.

CENTRAL PROVINCES—

Nagpur and Chhattisgarh and Wardha Valley Railways. Construction and working. Under the local administration, which accepts financial responsibility for the Chhattisgarh Railway.

BRITISH BURMA—

Local lines. Under the Local Administration, which accepts financial responsibility.

LINES IN NATIVE STATES—

The Nizam's. Under the Resident, Hyderabad.

Berars Branches. Under Great Indian Peninsula Railway Management, and controlled by Consulting Engineer to the Government of Bombay for Railways.

Kathiawar Railways. Under the Consulting Engineer to the Government of Bombay for Railways.

The Gaekwar's Railway. Under Bombay, Baroda and Central India Railway Management, and controlled by the Consulting Engineer to Government of Bombay for Railways.

Mysore Railway. Under orders of Resident, Mysore.

Bhopal Railway. Engineer-in-Chief, under orders of Director General of Railways.

Principal administrative orders passed during the year.

Amongst other important subjects regarding which orders were issued by Government during the year, the following may be here noted:—

Rates for the conveyance of troops, &c., on the East Indian Railway and State Railways.

Under the present contract of the East Indian Railway, the conveyance of troops is to be performed by the Company on the same general conditions as may for the time being be in force on State Railways, and at such rates as may be approved by the Secretary of State, "not being less than the highest rates in *force* for the time being for similar services on State Railways of the same gauge."

This rendered advisable a revision of the State Railway and East Indian Railway troop rates, so that one uniform and complete set of these rates could be laid down for these lines.

A schedule was consequently prepared, containing 16 items with rates for ordinary and troop extra trains, which after discussion was accepted by the Military Department and introduced with effect from the 1st January 1881.

Circular No. 25R. of 1880.

Certain rules were laid down for the examination of candidates for appointment to the superior grades of the State Railway Traffic Department.

Under these orders candidates are required to qualify in departmental work and language within two years from the commencement of their probation, failing which they are liable to be removed from the list of candidates.

Circular No. XIV R. of 1880.

Section 10 of the Indian Railway Act, 1879, requires that every agreement purporting to limit the obligation or responsibility imposed on a carrier by railway by the Indian Contract Act, 1872, sections 151 and 161, shall be in a form approved by the Governor General in Council. A series of forms was accordingly approved for use under the following circumstances:—

Form A.—When articles are tendered for carriage which are either already in bad condition, or so defectively packed as to be liable to damage or wastage in transit.

Form B.—When the sender elects to despatch at a "special reduced" or "owner's risk" rate articles for which an alternative "ordinary" or "railway risk" rate is quoted in the tariff.

Form C.—When at sender's request open trucks are used for the conveyance of goods liable to damage when so carried, and which under other circumstances would be carried in covered wagons.

Form D.—(This form was subsequently rendered unnecessary by the exemption of these agreements from stamp duty.)

Form E.—When booking uninsured horses of a declared value over Rs. 500.

Form F.—When booking low-priced horses, mules, and ponies tendered for despatch in cattle trucks instead of horse boxes.

Form H.—A standing agreement on terms similar to those in Form B.

Circulars Nos. XVII and XVIII of 1880.

General rules were passed for the grant of oil and fuel premia for economy in the consumption of these stores on earning engines. General rules were also framed for the payment of drivers and firemen by the trip instead of by actual time.

Circular No. XXXIX of 1880.

As recommended at the Railway Conference, a Committee was appointed to revise the Railway statistical forms. The Committee assembled on the 5th July 1880, and was dissolved on the 30th idem.—

PRESIDENT:

COLONEL J. G. MEDLEY, R.E., *Consulting Engineer for Guaranteed Railways to the Government of India.*

ACTING PRESIDENT:

W. C. FURNIVALL, ESQ., C.E., *from the 16th to the 21st July, inclusive.*

MEMBERS:

F. MATHEW, ESQ., C.E., *Agent and Chief Engineer, Bombay, Baroda and Central India Railway Company, from 5th to 13th July, inclusive.*
J. O'CONNEL, ESQ., *Chief Auditor and Accountant, Bombay, Baroda and Central India Railway Company, from 15th to 30th July, inclusive.*
R. C. S. MACKENZIE, ESQ., *Chief Auditor, East Indian Railway Company.*
JABEZ LIGHTFOOT, ESQ., *Chief Auditor, Sind, Punjab and Delhi Railway Company.*
CAPTAIN W. S. S. BISSET, R.E., *Manager, Rajputana State Railway.*
R. G. MACDONALD, ESQ., *Assistant Accountant General, Public Works Department.*
CAPTAIN R. A. SARGEAUNT, R.E., *Secretary.*

Revised forms were submitted to Government with a report, and the following orders were passed thereon:—

Circular No. XXXIXR., dated 20th October 1880.

RESOLUTION.—The report of the Committee may be divided under three main heads, *viz.*—

(i) the form of half-yearly revenue account;
(ii) the statistical returns submitted periodically to the Government of India;
(iii) the statements prepared in the Public Works Department of the Government of India.

2. Although it was not intended that the deliberations of the Committee should extend to the forms of *accounts*, the intimate connection between the review or analysis of working and the half-yearly revenue account rendered expedient the remarks in the report under this head.

Under the first head, the Committee recommend that—

in the statement of train-mileage No. XIV of the revenue account, the division of mixed train-mileage and of light mileage between coaching and goods traffic be given in a footnote;

the general merchandise traffic be entered in Abstract I of the revenue account as one item, and not subdivided into classes, as at present ordered;

the abstract of traffic in the principal commodities, in comparison with the figures for the corresponding half of the previous year, be furnished with the revenue account, in Form I, given at page 105 of the report.

In these recommendations, the Government of India concurs, and desires that they be generally adopted.

The abstract of traffic in the principal commodities should be placed after Statement No. XVIII of the half-yearly revenue account.

3. As regards the returns coming under the second head, with the addition of the item "Revenue Stores" to the form of Weekly Audited Traffic Return, the Government of India approves of the forms proposed for the following, *viz.*—

Weekly Approximate Traffic Return.

Weekly Audited Traffic Return.

Monthly Estimate of Working Expenses.

Supplementary Statement of Traffic.

Return of Traffic at Stations, and Station-to-Station Traffic Return, or "Revenue Statistics."

The abstract of traffic in the principal commodities should be submitted with the revenue account, as above desired.

The statement of the fluctuations of goods traffic should be continued as heretofore; but if it be thought desirable after further consideration to delay its publication until the figures can be procured from the statistical books of the Railway, orders will be passed on this point hereafter.

4. The form proposed for the half-yearly analysis of the revenue account is, subject to the following modifications, approved.

Item 16, which shows the percentage of working expenses upon earnings, excluding from both sides of the account the charges for carriage of revenue stores, appears to have been introduced for the sake of comparison with the accounts of past periods; this refinement seems unnecessary, but the entry may be allowed to stand for a term of four years, when its objects will have ceased to exist.

With reference to the division of expenses between coaching and goods traffic, the Government of India agrees with the views of the Committee, *viz.*, that the gross ton-mileage gives, on the whole, a basis for division of the expenses preferable to any other that has been proposed; and also that before such division is made, the expenditure should be reduced in the manner proposed in paragraph 15 of the report. It is, therefore, desired that the division be made on this basis, and that all items in the proposed form of analysis based on any other principle be eliminated.

The suggestions with regard to the calculation of the ton-mileage of rolling stock in paragraph 16 of the report are approved.

The percentages of repairs and renewals upon capital expenditure, items 131 to 136 of the anlaysis, cannot, it is thought, be made to serve any useful purpose; and as the opinions of the Committee on this point are equally divided, the Government of India does not hesitate to adopt the amendment given at the end of paragraph 18 of the report. The items giving these percentages may, therefore, be struck out.

As regards the offices in which the analyses of working should be prepared, the Government of India concurs in the proposals of the Committee expressed in paragraph 19 of the report and the Secretary of State will be addressed in the proposed terms.

5. In order that the suggestion of the Committee, *viz.*, that the summaries of the revenue accounts and of the analyses of working should be circulated, may have practical effect, it is necesssary that the documents to be summarised should be submitted to the Government of India with punctuality. The exchange of reviews, ordered in Public Works Department Circular No. 5 Railway, dated the 15th March 1878, may cease from the introduction of these orders; and if it should be found possible, as it is hoped, to circulate the summary of the revenue accounts with sufficient promptness, the exchange of the accounts will become unnecessary.

6. All the returns comprised under the second head, except the statement of alterations to works, &c., which should continue to be submitted as heretofore, should be prepared in the Audit Offices of the several Railways, and the dates proposed for their submission in the list marked K at page 96 of the report should be adopted. It is especially desired that every endeavour will be made to observe punctuality in this matter.

7. As regards the third main head, the suggestions for the preparation of the summary of the statistics contained in paragraphs 20 and 26 of the report are approved, and the statements will be prepared in accordance therewith, subject to such modification in form as may be necessary in consequence of the above orders on the form of the half-yearly analysis.

8. The recommendations in paragraphs 4, 11, 23, and 25 of the report, which relate to statements prepared in the office of Public Works Department, will be carried out.

9. These orders will have effect from the 1st January 1881, and care should be taken that all information necessary for the preparation of the analysis of working for the first half of 1881 is systematically recorded.

10. The form of the analysis of working proposed by the Committee should be amended as indicated above, and circulated for information and guidance.

11. The thanks of the Government of India should be conveyed to the President and Members of the Committee for the careful and complete manner in which they have dealt with the subject brought before them.

INDIAN COAL.

Coal has now been obtained for some years in India, and the collieries in the Bengal coal-fields near Burdwan and Ranigunge and in the Central Provinces at Mohpani and Warora have been in regular working order. The total output of Indian coal mines during the year amounts to 1,016,040 tons.* The greater part of this was contributed by the Bengal collieries.

Coal worked in Bengal and Central Provinces.

* Review of the Maritime Trade of British India for 1880-81, p. 32.

The Great Indian Peninsula Railway Company agreed to take, from 1st April 1880, 50,000 tons annually of Warora coal at Rs. 5 a ton, free of all royalty and all charges except carriage. Owing, however, to a breakdown in the machinery of the mine, the deliveries during the year have only amounted to 9,085 tons, or an average of 757 tons a month.

Warora coal.

The Railway Company are now receiving about 2,000 tons a month, and it is understood that an additional shaft has been sunk in the mines and is nearly ready to work, so that a large increase in the delivery of the coal may be shortly expected.

12,787 tons of Mohpani coal were received during the year, but the present output is about 800 tons per month, and larger receipts are not anticipated for the next two years.

Mohpani coal.

The coal-fields above specified are all connected with the railway system, and supply fuel at a cheap rate to those lines which are in their immediate neighbourhood. And efforts have been made to develop similar sources of supply for the railways which, being at a distance from these collieries, have to pay an enormously enhanced price for their coal.

The Sind, Punjab and Delhi Railway, for example, has to import its coal, partly from England and partly from Bengal. The price of a ton of English coal landed at Karachi is about Rs. 18.†

† Rs. 17 at par and Re. 1 for landing.

The price of Bengal coal is Rs. 3 per ton delivered into wagons at Giridi. By the time that it has been handed to Lahore‡ its cost is Rs. 30 per ton.

‡ Giridi to Lahore, 1,117 miles.

Coal is known to exist in Madras, in Assam, in the Punjab, in the province of Berar, and in the Palamow extremity of the Vindhya range.

Coal exists in Madras, Assam, and the Punjab.

In Madras some coal was procured in 1879 from Singareni in the Godavar district and tested. It was found to be good, serviceable fuel, but could not compete at the price at which it was delivered at Madras with the patent fuel in use on the Madras Railway.

Coal in Madras.

Coal borings are being prosecuted at Bhadrachalam in the Godavari District, and efforts are being made to bring the coal to Madras at a cheaper rate. The principal part of this coal-bearing area is situated in the Nizam's Dominions; until those mines are methodically worked, and the Nizam's Railway extended to them, it seems doubtful if any economical benefit will be derived from this coal-field.

English coal undersells Indian coal in Madras and Sind.

In the year under review tenders for the supply of 12,000 tons of Indian coal for the Madras Railway were called for. Four firms submitted tenders and samples of coal, and about 40 tons of each sample were tried. The Kurhurballie coal was found to be the best, but, as regards cost, did not compare favorably with patent fuel. The Kurhurballie coal was tendered at Rs. 27-4-0 per ton, but, to be on equal terms with patent fuel, it would have had to be tendered at Rs. 19-2-0.

Coal in Assam

In Assam large coal-beds have been discovered at Makum and Jaipur, which lie between Dibrugarh and Sadiya in the upper valley of the Brahmaputra; and a line of Railway will be shortly constructed to work these coal districts.

and in the Punjab.

In the Punjab, coal has long been known to exist in the Jhelum Salt Range; and so far back as 1866 this source of supply was investigated and the following report* published:—

* Report on the Coal Resources of India—Selections from the Records of the Government of India, Home Department, page 3.

The impression derived was that the quantity practically available would not prove large. But so far as the mines have been yet worked, there has apparently been no indication of exhaustion. The character of the coal does not entitle it to rank high as a coal for manufacturing purposes, being liable to spontaneous ignition.

The difficulty and the extreme cost of carriage no doubt tended to discourage the development of these coal workings; but the opening of the Salt Branch line to Miani, which is only 10 miles from the Salt Range, has tended to resuscitate their working. Experiments made during the year show that two tons of this coal do about the same work as three tons of Bengal coal; and that if it is found in considerable quantities, it may be delivered on the Punjab Northern Railway at Rs. 10 a ton against the Rs. 30 which a ton of Bengal coal at present costs. But the experiments have not yet been concluded, and the coal has not yet been found in sufficient quantities to enable a judgment to be formed as to whether the supply is likely to be of more than a temporary nature. Moreover, the Punjab Government proposes to place such a high royalty on the output as will seriously interfere with the use on a large scale of this coal.

As in the case of the Sind, Punjab and Delhi Railway above quoted, it often seems that it is economical to work English coal at one end of the line and Indian coal at the other. In the case of the Great Indian Peninsula Railway, for instance, no less than five different kinds of coal were used on the line; and, as a typical instance of the distribution of coal on a line, the following extracts are given from the Administration Report of the Consulting Engineer for Railways to the Government of Bombay:—

Distribution of coal over the Great Indian Peninsula Railway.

The quantities of the various descriptions of coal used during 1880 compare as follows with those for 1879:—

Description of coal.	1880.	1879.	1880.	
			Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
English	83,542	91,031	.....	7,489
Warora	9,085	18,547	.....	9,462
Bengal	9,379	12,389	.....	3,010
Mohpani	12,787	6,621	6,166	....
Total ...	114,793	128,588	6,166	19,961
		Net decrease in 1880 ...		13,795

The following table shows particulars of the results recorded in connection with the consumption of coal during the two halves of the year compared with 1879 :—

	30th June.		31st December.	
	1879.	1880.	1879.	1880.
	Tons.	Tons.	Tons.	Tons.
Quantity consumed { English	56,305	46,461	34,726	37,081
Quantity consumed { Indian	22,321	20,740	15,236	10,511
	Rs.	Rs.	Rs.	Rs.
Cost per ton { English	19·37	18·19	18·62	19·18
Cost per ton { Indian	11·01	9·5	13·06	13·12
Cost per ton { Average	16·81	16·01	16·92	17·87
	As.	As.	As.	As.
Cost per engine mile	5·16	4·70	4·78	4·65
	lbs.	lbs.	lbs.	lbs.
Quantity used per mile	43·11	41·18	39·39	36·45

The quantities of the various kinds of coal received by the Company and the average cost of each per ton during the two halves of the year are compared with the corresponding periods of 1879 in the subjoined statement :—

Description.	30th June.				31st December.			
	1879.		1880.		1879.		1880.	
English ... { Quantity ...	Tons	31,088	Tons	42,089	Tons	47,909	Tons	42,031
English ... { Cost per ton ...	Rs.	19-8-0	Rs.	18-3-2	Rs.	18-8-0	Rs.	18-10-2
Nerbudda ... { Quantity ...	Tons	5,773	Tons	7,086	Tons	4,833	Tons	2,303
Nerbudda ... { Cost per ton ...	Rs.	9-0-0	Rs.	9-0-0	Rs.	9-0-0	Rs.	9-0-0
Bengal ... { Quantity ...	Tons	8,890	Tons	1,373	Tons	7,193	Tons	3,125
Bengal ... { Cost per ton ...	Rs.	19-3-6	Rs.	19-3-6	Rs.	19-7-3	Rs.	19-11-3
Barakar ... { Quantity ...	.....		Tons	961	.....		Tons	2,940
Barakar ... { Cost per ton ...	.....		Rs.	19-9-0	.....		Rs.	19-8-5
Warora ... { Quantity ...	Tons	10,280	Tons	6,656	Tons	7,223	Tons	3,152
Warora ... { Cost per ton ...	Rs.	7-7-8	Rs.	6-7-6	Rs.	9-15-6	Rs.	6-7-6

The rate per ton shown against English coal includes landing in Bombay; that for Nerbudda coal is the rate paid at the mine, including loading into trucks; those for Bengal and Barakar coal include freight to Jubbulpore; and that for Warora coal includes freight to Wardha.

Particulars of the consumption of wood fuel during the two years will be found below :

	30TH JUNE.		31ST DECEMBER.	
	1879.	1880.	1879.	1880.
Quantity consumed	Tons 722	Tons 1,134	Tons 839	Tons 956
Cost per ton	Rs. 4-15-7	Rs. 5-5-4	Rs. 5-6-1	Rs. 5-1-7
Cost per train mile	As. 0·02	As. 0·03	As. 0·03	As. 0·03
„ engine mile	„ 0·01	„ 0·03	„ 0·02	„ 0·03
Quantity used per train mile	lbs. 0·45	lbs. 0·77	lbs. 0·75	lbs. 0·82
„ per engine mile	„ 0·40	„ 0·69	„ 0·66	„ 0·73

Experiments have been made to test the relative values of the different kinds of coal, but they have never been made under the most favorable circumstances; that is to say, the locomotives have not always been adapted to the special requirements of each kind of coal. Roughly speaking, however, if the English coal usually imported into India is taken at 100, the other kinds may be taken for comparison as follows :—Bengal coal, 95; Mohpani, 75; patent fuel, 70; Warora, 70.

REVIEW OF FINE FUNDS.

The following tabulated statement shows the working of the fine funds on State Railways during the year:—

Fine Funds.

Railways.	Opening balance on 1st April 1880.	Receipts during the year ending 31st March 1881.	Total.	Disbursements during the year ending 31st March 1881.	Balance on 1st April 1881.	Remarks.
STATE.						
Punjab and Sind.	Rs.	Rs.	Rs.	Rs.	Rs.	
Punjab Northern ...	5,148	3,321	8,469	(a) 980	7,489	(a) Made up chiefly of the cost of ice and refund of fines.
Indus Valley and Kandahar ...						
North-Western Provinces Provincial.						
Muttra-Hathras ...						
Cawnpore-Farukhabad ...	Not opened till end of 1880.					
Dildarnagar-Ghazipur ...						
Bengal Provincial.						
Calcutta and South-Eastern ...	438	118	556	1	555	
Nalhati ...	482	76	558	...	558	
Northern Bengal ...	5,782	1,992	7,774	(b) 3,625	4,149	(b) Made up principally of the amount spent for the benefit of the railway employés and their families.
Tirhoot ...	1,445	545	1,990	(c) 752	438	(c) This amount is made up of the iron spent for completion of the rifle range at Somastipur Junction and for books purchased for the Institute.
Patna-Gya ...	211	343	554	3	551	
Bombay and Central India.						
Rajputana ...	9,699	6,708	16,407	(d) 3,703	12,704	(d) Made up of payments to schools, expenditure on Railway Institute, and remissions.
Holkar and Sindia-Neemuch ...	2,948	1,026	3,974	(e) 905	3,069	(e) Made up of the amount expended on the Mhow school and garden and of donations given to the Railway Institutes at Mhow and Khandwa for books, furniture, &c.
Sindia ...	Worked by East Indian and Rajputana Railways.					
Dhond and Manmad ...	913	1,246	2,159	(f) 2,099	60	(f) Expended in assisting employés discharged or transferred on the relinquishment of the working of the line by Government.
Central Provinces.						
Wardha Coal ...	79	317	396	...	396	
Nagpur-Chhattisgarh ...	76*	75†	151	...	151	* *To end of December* 1880. † *From 1st January* 1881.
Burma Provincial.						
Rangoon and Irrawaddy Valley ...						
Native States.						
Bhavnagar-Gondal ...		114	114	...	114	
Gaekwar of Baroda's ...	Worked by B. B. & C. I. Railway Company.					
Khamgaon ...	Worked by G. I. P. Railway Company.					
Amraoti ...	Worked by G. I. P. Railway Company.					
Nizam's ...	667	794	1,461	(g) 231	1,230	(g) Expended principally on cricket outfit, improvement of station gardens and gate lodges, and purchase of books for Railway library.
Mysore ...	Not opened till 1881.					

CHAPTER VI.

HISTORY OF THE GAUGE IN INDIA.

Précis of correspondence regarding the adoption of the 5′ 6″ and 3′ 3⅜″ gauges for Indian Railways.

THE standard gauge adopted for trunk lines of railway in Great Britain, on the continent of Europe (except Russia), and in America is 4′ 8½″. It is probable that no careful consideration was given to this actual dimension when it was selected as the gauge of the wheels of the first locomotive made, but it happened to be the gauge of the tramways used in the district where George Stephenson made his first locomotive railway.

After very careful consideration by a Royal Commission, a gauge of 5′ 3″ was adopted as the standard for Irish railways. In Russia the gauge is 5′.

In 1841, Sir Macdonald Stephenson began to draw public attention to the importance of undertaking railways in India, and with that object in view visited Calcutta in 1843. In the same year Mr. G. T. Clerk visited Bombay at the instance of the then Governor of Bombay, Sir George Arthur, with a similar object.

In 1845, two private associations under the designation of the "East Indian" and the "Great Indian Peninsula" Railway Companies were formed in England; but the projectors found it impossible to raise the necessary funds for their proposed schemes without the assistance of Government. The application for this aid led to a protracted discussion; and it was not until 1850 that any practical commencement of railway construction took place in India. Early in 1849, it was determined to assist these Companies by guaranteeing to them a certain fixed rate of interest on their capital expenditure, and the deeds of contract with both Companies were sent out to India towards the close of the year. Paragraph 13 of the transmitting despatch runs thus:—"With respect to the weight of rails and gauge of line to be employed on these railways, we are disposed to recommend those used by the North-Western Company here, namely, a gauge of 4′ 8½″ and a weight of rails of 84 lbs. to the yard, as combining the greatest utility and economy." At that time Lord Dalhousie was the Governor General, and Mr. W. Simms, C.E., the Consulting Engineer to the Government of India for Railways.

J. Danvers' Report on Indian Railways to end of year 1859.

Court of Directors of the East India Company, to Government of India, No. 27, dated 14th November 1849.

The despatch was duly considered in India. The Consulting Engineer for Railways reported on the subject, and the Governor General recorded a Minute, both of which were transmitted to the Court of Directors with a despatch recommending that a gauge of 6′ be adopted for Indian railways.

Railway Despatch from Government of India, to Court of Directors of East India Company, No. 1, dated 2nd August 1850.

Mr. Simms recorded his reasons for recommending a wider gauge than 4′ 8½″ as follows:—

The wider gauge of 5 feet 6 inches, which I would recommend for adoption, will give 9½″ more space for the arrangement of the several parts of the working gear of the several parts of the locomotive engines; and this additional space will be more needed in India than in Europe, not only on account of the machinery itself, but it would lower the centre of gravity of both the engines and carriages, the result of which would be to lessen their lateral oscillation, and render the motion more easy and pleasant, and at the same time diminish the wear and tear.

The lowering of the centre of gravity, consequent on the adoption of the wider gauge, appears to me of great importance for another reason, namely, the fearful storms of wind so

frequent at certain seasons of the year, and I think it very probable that in one severe nor'-wester, not to mention such hurricanes as that of 1842, the additional 9½″ of width might make all the difference between the safety and destruction of the trains; and one such accident attended, as it doubtless would be, with great loss of life, would probably retard the progress of the railway system in this country very considerably.

The following extract from Lord Dalhousie's Minute refers to the question of gauge:—

32. The Court of Directors have recommended at the same time the use of the narrow gauge of 4′ 8½″ for the railway about to be constructed. Although the letter of the Court recommends, but leaves to the Government of India to determine as to the gauge which should be adopted on this occasion, I consider the question to be one of such moment as to deserve a careful consideration and an authoritative and conclusive decision by the highest authority connected with the Indian Empire, who alone can have access to that full information and extended experience which would make such a decision really and satisfactorily conclusive.

33. The British Legislature fell unconsciously, and perhaps unavoidably, into the mischievous error of permitting the introduction of two gauges into the United Kingdom. The numerous and grievous evils which arose from that permission are well known, and will long be felt throughout all England. The Government of India has it in its power, and no doubt will carefully provide that, however widely the railway system may be extended in this empire in the time to come, these great evils shall be averted, and that uniformity of gauge shall rigidly be enforced from the first. But I conceive that the Government should do more than this, and that now, at the very outset of railway works, it should not only determine that any uniform gauge shall be established in India, but that such uniform gauge shall be the one which science and experience may unite in selecting as the best.

34. At one time this question was much before me; and although I should not myself attempt to offer an opinion on so vexed a question, yet I may venture to form one on the recorded views of men competent in every way to judge. The evidence which has been given before the Gauge Commissioners in 1846, and evidence which has been given from time to time before the Committees of Parliament, backed as it has been by very high authority abroad, is, I venture to think, sufficient to show that the narrow gauge of 4′ 8½″ (a measurement adopted originally at hap-hazard and from the accident of local circumstances) is not the best gauge for the general purposes of a railway, and that something intermediate between the narrow gauge of 4′ 8½″ and the broad gauge of 7′ will give greater advantages than belong to the former, and will substantially command all the benefits which are secured by the latter.

35. The circumstances which have been brought forward by Mr. Simms in his report, applicable especially to this country, strengthen the reluctance which I feel to introduce the 4′ 8½″ gauge into India without a very deliberate reconsideration of the question with reference to India, under the direction of the Hon'ble Court, by the Board of the East Indian Railway Company. I should not have felt satisfied that I had done my duty if I had not brought this question pointedly under the consideration of the Court, requesting them formally and finally to determine whether a wider gauge than the 4′ 8½″ ought not to be established in India, and whether the gauge of 6′ which was recommended by engineers of eminence in England, and which was preferred also, if I recollect rightly, by M. de Pambour, should not be introduced on the experimental line in Bengal, and at the same time on the line which is in course of construction at Bombay.

In reply to this despatch, the Court of Directors were "disposed to think" a gauge of 5′ 6″ was the most suitable, and communicated that decision to the several Indian Railway Boards in London. This decision did not coincide with the views of the authorities; and Major J. Pitt Kennedy, who had succeeded Mr. W. Simms as Consulting Engineer for Railways, suggested that further reference to the Court of Directors might be made. To this Lord Dalhousie assented, recording his opinion in a Minute. The referring paragraphs are as follows:—

Court of Directors, to Government of India, No. 46, dated 4th December 1850.

2. It does not appear from the despatch of the Hon'ble Court whether their determination to fix the gauge at 5′ 6″ was the result of any deliberate inquiry, or whether the figure was merely indicated as a mean between the extremes of the present narrow gauge and that which I took the liberty to suggest. If the Hon'ble Court have fixed upon 5′ 6″ for the Indian gauge on high recognised authority, and adhere to it, of course the Government has only to obey. But if it is not the case, the Court will pardon the importunity which, for their own present and future interests, urges them to take other counsel before they issue a peremptory mandate on this important point.

3. I know of old that particular figures have been fixed upon originally for a gauge, and for others proposed in substitution of it, without the author of the proposal being able to give any reason whatever for selecting the particular dimensions he has specified. The original narrow gauge of 4′ 8½″ was adopted for no other reason than because it happened to be the width of the colliery tramway on which locomotive power was first tried. When a general alteration was proposed, I recollect it being said that the principle on which one gentleman proceeded was to take all the different gauges, strike the average, and propose the figure that resulted as the best universal gauge. But I think that many good reasons were formerly given for the superiority of a 6′ over the broad and narrow gauges, and I feel confident that many more could be given why that gauge should be selected for India, in preference to either of the original gauges, or to the one now selected by the Hon'ble Court.

4. At all events, if formal inquiry has not been entered into, I earnestly request the Hon'ble Court to permit the question to be so far reconsidered as to receive such reports and evidence on the subject as are suggested by Major Kennedy in the 15th paragraph of his present report. If this is not in accordance with the resolution of the Hon'ble Court, I shall much regret it; for I think that those who come after us will see cause to lament that the originators of this great system in the East did not profit so much as they might have done by the errors of their predecessors in Europe.

A communication to this effect was made to the Court of Directors, but the recommendation to increase the gauge to 6′ was not assented to, the Court of Directors saying that their decision had been "arrived at after a very careful consideration of the subject, and with the best opinions that we could obtain. That decision having been communicated to the Railway Companies who have entered into contracts for the execution of works, and for the provision of materials on the presumption that it is final, it would lead to much inconvenience and expense if any alteration were now permitted."

Government of India, to the Court of Directors, No. 3, dated 7th March 1851.

Court of Directors, to Government of India, No. 45, dated 20th August 1851.

This decision was accepted by the Government of India, and the 5′ 6″ gauge was adopted as the standard gauge for the trunk lines in British India.

Early in 1857, the Court of Directors received several proposals for the construction of railways through Rohilkhand and through the then newly annexed province of Oudh. The Court conceived that the time had come for ceasing to grant guarantees, and anticipated that the Companies would have no difficulty in raising the necessary funds, with only moderate assistance from Government. These proposals were referred to the Government of India for a full report on the system of communications in that part of India, and suggesting that the kind of railway required should be distinctly indicated.

Court of Directors, to Government of India—
No. 5 of 28th January 1857.
„ 7 of 4th February „
„ 23 of 26th May „
„ 38 of 2nd September „

The Government of India suggested that, in preference to giving any more guarantees, the Court of Directors having intimated, meanwhile, that their expectation regarding the raising of money in the English market without a guarantee were unfulfilled, the State should undertake to build its own railways in Oudh. Lord Stanley, who was Secretary of State when this matter came up for decision, was not of opinion that Government should build its own railways, although he did not object to Government doing so on a small scale, such as connecting its iron works at the foot of the Naini Tal hills, &c., to the trunk lines. This policy was reiterated by Sir C. Wood, who succeeded Lord Stanley as Secretary of State, and the surveys for railways in Oudh were conceded to certain Railway Companies. The various proposals were reviewed in a note dated 7th September 1861 by Lieutenant-Colonel H. Yule, then Secretary to the Government of India for Public Works. As regards the gauge, Colonel Yule remarked :—

Secretary of State, to Government of India, No. 16 of 24th February 1859.

Despatch from Secretary of State, No. 106 of 29th October 1859.

The results of the cattle-draught line as here exhibited are more precisely favorable. Were the enterprise destined to remain purely local, this might therefore be preferred. But such a line is not capable of great development; a large traffic derived from a wide extent of country would choke it, and demand an amount of line and dead stock excessively unwieldy and unmanageable.

If the cattle line were adopted, I adhere to the view expressed in 1855, that the gauge of the great railways should be altogether discarded. I can see no object in adopting it sufficient to compensate for the great additional weight which it will involve. Nay more. I would now extend the same views to the light locomotive line. I do not dispute for one moment that the great primary network of continental railways should be of one gauge. But we propose here quite a different style of work. Is it worth while, on account of the necessity of transhipment at two eventual points of contact—one of which will probably be on a great river (the Ganges at Cawnpore) likely to remain unbridged for a generation, and therefore a break in any case—to give up a great economy? In the English gauge controversies there was no separation, either in character or locality, between the lines of different gauge. It was but the predilection and practice of one set of engineers pitted against those of another set, on lines of the same character constantly interlacing. I must at the same time apologise for venturing such an opinion after the views of Government and of Lord Dalhousie have been so strongly expressed the other way.

The views were adopted by the Government of India, for in December 1862, when Mr. J. E. Wilson, the Agent for the Indian Branch Railway Company, reported to Government that he was "prepared to enter into definite arrangements for the construction of the roadways and the laying down of light railways thereon" in Oudh and Rohilkhand, the Government of India, in passing orders on the reference, laid down the following conditions as regards the gauge :—

From Government of India, to J. E. Wilson, Esq., No. 5144, dated 29th December 1862.
P. W. D. Pros., March 1863, No. 13.

The first point that calls for remark is the gauge, to which you make no special allusion. * * * His Excellency in Council is of opinion that it will be essential to insist on the adoption of the standard Indian gauge of 5 feet 6 inches in the case of all railways that are intended to form portions of main lines. But when the lines proposed are designed as *bonâ fide* tramways, that is, feeders to the main system but not essential parts of it, and when the expected traffic may warrant the outlay necessary for the formation of a full gauge line, the Government of India will sanction, as it has already done in the case of the Nalhati line, narrow gauge light lines, as a temporary expedient, on the conviction that such lines will be replaced by full gauge lines of a more substantial character whenever the development of the traffic renders such a change advisable. Where such narrow gauge lines are sanctioned, it will therefore be an advantage that they should be of the lightest and most economical description compatible with safety and the necessary degree of permanence, in order that there may be the least possible difficulty in the way of the change when it has become expedient, and that there may be no doubt as to their temporary and provisional character, and no risk of their being permitted to grow into a system which would compete with the system constructed on the standard or national gauge.

A slight digression here is necessary to give an outline of the objects of the Indian Branch Railway Company, and how they were affected by the question of the gauge. Of all the numerous Companies that were projected for building light railways in India, this was the only one in Northern India that actually did proceed to make lines in India. The original projector of this Company was Mr. J. E. Wilson; and it was his desire to lay light lines of railway on existing roads, but on a narrower gauge to that on the trunk lines, and thus act as feeders to the trunk lines. This idea seemed the only feasible method by which a large network of light railways could be spread over India; it was welcomed by Lord Canning as a probable solution of a most difficult problem, and was heartily backed by him during the latter months of his stay in India. The first offer made by this Company was to construct a light line of 4 feet gauge on a road which the Government of Bengal were just completing between Nalhati station on the East Indian Railway and Azimganj, situated on one of the effluents of the Ganges and on the road to Murshedabad. This line was actually made without a guarantee, was opened for traffic on the 21st December 1863, and is still working on its original gauge. It was, however, bought by the Government in 1868, and has been remodelled on a more permanent basis.

P. W. D. Pros., June 1864, No. 61 E.
P. W. D. Pros., January 1868, No. 24.

Lord Canning was succeeded by Lord Elgin on 12th March 1862.

This Company then desired to make a light line between Cawnpore and Lucknow and other lines in Oudh and Rohilkhand, and they actually did complete the Lucknow-Cawnpore line. The Company, however, found that they could not raise sufficient capital to continue their ventures, and appealed to the Secretary of State for a guarantee. This was eventually given, and the Indian Branch Railway Company merged into what is now known as the Oudh and Rohilkhand Railway Company.

But before permission to construct the Lucknow-Cawnpore line was given, the views of the Indian Government had considerably changed. Lord Elgin's Government would hear of no narrow gauge railways, except in such detached and fragmentary sections as held out no promise of being ever worked remuneratively from the heavy cost of the independent establishments.

Indeed, it seems that Mr. J. E. Wilson himself had changed his ideas, for it is stated that he "readily accepted the 5 feet 6 inches gauge for all his lines," &c. This is to be found in the note written on the whole matter by Colonel Strachey immediately after Lord Elgin's death, and in which is embodied, as far as was known, Lord Elgin's opinions in the case.

Public Works Department Proceedings, June 1864, No. 61.

Sir C. Trevelyan, in a Minute dated 4th September 1863, also recorded a strong protest against making either light railways or railways on any other but a uniform gauge. The following extract refers to the question of gauge:—

Public Works Department Proceedings, June 1864, No. 54.

I have always been of opinion that a fallacy is involved in the idea of light railways. The railway experience in England is greater than that of any other country. For many years after our railway system commenced, there was a constant craving after a cheaper kind of railway. Project after project appeared for the formation of light railways or tramways, but they were all dropped. Atmospheric and other eccentric forms of railway were attempted; but, however specious the light railway principle might be, there was something in it which always led to its being abandoned on close examination; and it never arrived even at the dignity of an experiment. Cheap agricultural railways are now being made in various parts of the country, but they are all solid, full gauged railways, quite capable of bearing the rolling stock of the main lines with which they are connected, and their cheapness arises only from their being single lines; from the landed proprietors asking moderate rates for their land, because they are convinced of the advantage to them of the railways; and from the Parliamentary expenses having been reduced to a mere trifle.

Experience is so much better than theory, that I will not waste time in endeavouring to account for these results. The fact seems to be that a metalled road is a cheap medium of communication, and so also is a solidly constructed railway, but that a railway which is constructed in such a manner that it will not admit of the full application of the power of steam is not an economical medium.

The practical difficulties in the way of converting a narrow gauge into a full gauge railway are so great, that I look upon the power which it is proposed to reserve to the Government of ordering such a conversion to be entirely illusory. Earthwork, bridges, rails, rolling stock, all have to be constructed on a different scale for a narrow and medium gauge, and, as observed by the Hon'ble the President, in the event of conversion, a small section of the earthwork and ballast and some buildings will be all that would be saved.

The 'longitudinal' line, of which the Indian Branch Railway Company desires the concession, is no branch but a main line more than 500 miles long, passing through some of the richest and best populated provinces of the empire. Even the branches to Cawnpore and Koorja, connecting this line with the East Indian, are so important, that the Government very properly stipulated that they should be laid on the standard gauge. The commonest foresight, therefore, requires that the main line as well as these branches should be laid on the standard gauge; and if the Branch Railway Company obtains the concession, it must change its name and concentrate its efforts on the construction of an entire system—main line and branches—on the splendid field which will be placed at its disposal. The Indian standard gauge is 5 feet 6 inches. The gauge fixed upon by a Government Commission for the Irish railways as the smallest which could with advantage be adopted was 5 feet 3 inches.

The negotiations with the Indian Branch Railway Company were reported to the Secretary of State in April 1864 (Sir J. Lawrence, Governor General), and the despatch was accompanied by all the notes and minutes that had been written in Lord Elgin's time. The arrangements made by Lord Elgin's Government were assented to generally; and the following extracts from the despatch will show that a gauge narrower than 5 feet 6 inches was deprecated, unless nothing better could be got without a guarantee:—

Despatch to Secretary of State, No. 29, dated 12th April 1864.
Public Works Department Proceedings, June 1864, No. 72.

13. In contemplating the construction of light railways of the 5 feet 6 inches gauge, Lord Elgin had never intended that the *engines* of the heavy lines should run on them. It was well understood that in England engines of one Company are rarely run on the line of another, and that the practical working of railways is not compatible with such a system of interchange of engines, and that all that is ever requisite is the interchange

of wagons and carriages. A 5 feet 6 inches gauge light line was accordingly considered to mean a railway capable of carrying at a moderate speed the ordinary passenger and goods vehicles in use on the Indian main lines.

14. Having these views, Lord Elgin authorised an arrangement being made with Mr. Wilson, by which the character of the Oudh and Rohilkhand lines was to be defined, by declaring that the maximum load per wheel should be 3½ tons, and the maximum speed 15 miles an hour. This will allow of the ordinary wagon and passenger stock of the East Indian Railway running over the Oudh lines whenever the Ganges bridges are finished. To these arrangements of Lord Elgin we give our complete assent.

* * * * * * * *

29. It only remains to us to call attention to two Minutes of Sir Charles Trevelyan, in the arguments of which we have been unable to concur.

30. In his first Minute, dated 30th September last, objection is taken to the construction of narrow gauge and light railways. So far as the present proposals are concerned, the question of narrow gauge lines does not arise. But we are not prepared to recede from the position before taken up by the Government of India in respect of such lines, *viz.*, that when nothing better can be got, and with due provision for their resumption and conversion into full gauge lines when the traffic calls for the change, the Government may without objection aid such lines, in each case determining the amount of aid with reference to the objects to be attained.

31. As regards light lines, very nearly the same remarks will also apply. As soon as the Government gives up the system of guarantee, and abandons all right or desire to interfere in the management of Railway Companies' affairs, it ceases to be in a position to decide whether a line shall be constructed of rails of one class or another. Such a matter is essentially one for the Company to determine. What the Government can do is to decline giving assistance, unless certain terms are offered by the Companies, as the Companies can refuse to accept the assistance offered if it be too little to satisfy them. The Government of India has adopted the conclusion that a 5 feet 6 inches gauge line of such a character as will admit of the carriage and wagon stock of the great lines going over it at a moderate speed will probably be for many years to come sufficient to meet the requirements of the country, and this general standard it has taken as the *minimum* for the full gauge lines. * * *

It may be here remarked that the Indian Tramway Company had been allowed to build a line between Arconum and Conjeveram in the Madras Presidency on a gauge of 3 feet 6 inches. This line was 19 miles in length, and was opened to traffic on the 8th May 1865. Proposals to convert this gauge into the 5 feet 6 inches gauge and extend the line to Cuddalore and Pondicherry were made at intervals between 1866 and 1868. The Madras Government recommended the extension to Cuddalore; but when the nature of the country through which the extension would have to pass was considered, that Government could "not recommend any departure from the present (3 feet 6 inches) gauge on which the line from Arconum to Conjeveram has been laid." In 1868 this line was included in the 3 per cent. guarantee accorded to the Carnatic Railway Company, and in turn was in 1874 absorbed by the South Indian Railway Company under their 5 per cent. guarantee. Its gauge was converted to the metre in July 1878.

From Madras Government, No. 530, dated 17th February 1869.

The failure of the Indian Branch Railway Company to raise money in the London market for their projected railways throughout Oudh and Rohilkhand led that Company to make overtures to the Secretary of State for a guarantee of interest on all capital raised. It was recognised that the public would not venture their money without some kind of State guarantee; and so, if the development of the country by increased railway communication was desired, it could only be done by reverting to the old guarantee system. In 1866 the Secretary of State (Lord Cranborne) was disposed to give, with certain modifications, a guarantee of 5 per cent. in interest on the capital raised, as had been accorded to the older Railway Companies; and this was reiterated by Sir Stafford Northcote in 1867. The consideration of the draft deed of contract sent out to the Government of India for approval led the Viceroy (Sir John Lawrence) to record a Minute, dated 16th August 1867, on the

From Secretary of State, No. 30, dated 25th June 1866.
From Secretary of State, No. 18, dated 28rd March 1867.

guarantee system, and in which the extension of railways throughout India by direct State agency was foreshadowed.

This Minute was followed by another by Sir John Lawrence, reviewing minutely the whole question of railway extension. It is dated the 9th January 1869, three days before Sir John Lawrence made over the high office of Viceroy and Governor General of India to Lord Mayo. Little time was lost by Lord Mayo in reporting to the Secretary of State on the subject of railway extension in India, and in March of that year a series of despatches was sent home advocating the immediate construction of several lines of railway—some by the agency of Companies, and some by direct State agency. The policy advocated was that an extension of railways was absolutely essential to the proper development of the resources of India; that the finances of India could not bear the burden of the proposed additional railways if constructed on the same expensive principle as had hitherto ruled; that Government was quite capable of making its own lines, and that as it could raise money cheaper than a Company, to make its own lines was the more economical proceeding; that the position of several of the proposed lines was such as did not demand a first class standard railway, and that either a lighter construction, or a narrower gauge, or both, could be adopted with economical advantage; and that Government, possessing its own railways, would be capable of exercising on the spot a more efficient and economical management than if administered by a Board of Directors in London. The Duke of Argyll was then Secretary of State for India, and he approved of Lord Mayo's proposals almost in their entirety.

Despatch to Secretary of State, No. 24, dated 11th March 1869.
Despatch to Secretary of State, No. 25, dated 11th March 1869.
Despatch to Secretary of State, No. 28, dated 22nd March 1869.
Despatch to Secretary of State, No. 42, dated 15th July 1869.
Public Works Department Proceedings, Railway, April 1869, Nos. 84 to 95.

The introduction of the metre gauge as the gauge for certain railways in India may be said to have arisen from this correspondence. The following portions of the correspondence* are those that bear on the question of a narrower gauge than the standard gauge of 5 feet 6 inches:—

* Sir John Lawrence's Minute, dated 9th July 1869.

42. There is only one other point to which I wish to refer. If there is one thing which comes out in more prominent relief than another in connection with railway construction in all parts of the world, it is this, that those lines are financially successful in which the capital accounts are kept down to a low amount, and those are unsuccessful in which this has not been accomplished. The lesson we should learn from this is, that the character of the line and the amount of expenditure upon it should be regulated as far as possible by a proper consideration of the possible returns, and not more than is essential by any preconceived ideas of what is the best standard form of railway to adopt. I regard it as the extreme of infatuation to lay down any absolute rules to regulate the modes of construction of railways in a country so vast, so various in its natural features, and so poor as India. Still more mistaken is it to apply to India rules essentially based on the wants of England, which is probably the country in the world from which India most widely differs. England, of all others the richest, the most populous, the most celebrated for its manufactures, the most addicted to commerce; an island of small size in a highly advanced state of civilization, where dispatch is of extreme importance and time equivalent to money; England of all countries is the last which we should take as our model in these things. In one respect certainly, but only in one, can I admit that English standards are applicable—let all workmanship be thoroughly good of its kind, and every part of the construction permanent and suited to what is required of it.

43. Skill in engineering works implies the successful adaptation of the art of construction to varying circumstances. For a poor country, economy is one of the essential conditions to be complied with, and its requirements may be as rigid as any of those imposed by physical conditions. Wholly to reject railways for a country which is not able to support lines of the most costly description is quite unreasonable; and if, on a further examination in detail of the probable cost and returns of any of the lines which otherwise seem desirable, the expense of lines of the ordinary gauge seems prohibitory, while lines of a narrow gauge would be financially practicable, I should consider it a most mistaken view to reject the narrow gauge line. And so with any other modification of ordinary practice. For complete success in the great operations which the Government of India has before it, broad views and a ready adoption of all truly sound measures, whether out of the usual course or not, are essential, and it will be a source of lasting regret if the progress of this country, which of all others most directly depends on the improvement of its means of internal communication, should be retarded by the weight of administrative prescription or engineering prejudice.

Again, discussing the question of a line of railway between Pondicherry and either Madras or Arconum, the Government of India wrote:—

Despatch to Secretary of State, No. 25R., dated 11th March 1869.

27. Although we are far from opposing the adoption of a narrow gauge railway when circumstances seem to indicate that proper financial results cannot otherwise be obtained, we are not inclined to acquiesce in the expediency of constructing short lengths of railway on a gauge different from that in common use. If narrow gauge lines are to have a fair field, they must be given a sufficient development to render the cost of shifting goods from their wagons to those of adjoining broad gauge lines unimportant in relation to the freight for the average distances over which the goods are carried. We do not think that this condition can be properly complied with, unless 100 or 200 miles at least of a narrow gauge system is constructed, and short of this we should not view favorably a proposal to execute narrow gauge lines in a country so easy as that immediately south of Madras. The known desire of the French Government to obtain a railway connection with Pondicherry by a line of the full Indian gauge should, we think, have much weight in the decision come to on this question; and on the understanding that the outlay will be kept down to the sum valued in the estimates that have been made, about £7,000 per mile, we are clearly of opinion that the 5 feet 6 inches gauge for this railway should be adopted, as far at least as the point from which the line to Pondicherry would leave it.

And, in calling the attention of the Secretary of State to that portion of Sir John Lawrence's Minute extracted above, the Government of India wrote:—

Despatch to Secretary of State, No. 28R., dated 22nd March 1869.

19. The considerations which have led us to these conclusions also indicate that, under the conditions in which India is placed as to the provision of capital for railways, if it appears to be financially impossible to carry out railways on the full 5 feet 6 inches gauge, the Government should not hesitate to accept any other system of construction which will afford a practical means of extending these works. It is quite well known that perfectly useful and satisfactory lines have been carried out on a much narrower gauge, and it would be evidently unreasonable to reject the provision of such railways if they afford evidence of being profitable, while broader gauge lines, from their greater cost, could not be undertaken with financial propriety. These remarks more particularly apply to the more thinly-peopled and hilly tracts of the Peninsula and Central India. Across these Provinces, main lines on the full gauge have already been carried, giving communication between Bombay and Madras on the one side, and Bombay and the North-Western Provinces on the other; and whatever advantage is to be obtained by the possible transfer of the rolling stock of the north to the south of British India has thus been secured. For the further extension of the network of railways, no hesitation should be felt in accepting whatever system of construction is proved to be economically the best suited to each case.

20. We are disposed, as we indicated in our last despatch on this subject, No. 25, dated 4th March, to consider that too great importance has been attached to the value of uniformity of gauge beyond certain limits. That there are many conveniences in uniformity of gauge is, of course, evident, and in a compact, densely peopled, and highly civilised country like England differences of gauge have been proved by experience to be inconvenient and are highly undesirable. But the inconveniences, where the distances to be gone over are very great, all the centres of population and trade are far apart, as is commonly the case in India, are of a secondary character. For passenger traffic, changes of vehicles, if not frequent, are a very minor objection, and are commonly enforced on passing from the lines of one Company to those of another in every country. For goods, changes of vehicles represent a certain additional charge for loading out of one set of wagons into another. This charge will commonly not exceed the cost of transport for 10 miles of railway, and the practical inconvenience is no greater than that which would have been caused by such an addition to the distance over which the goods had to be carried.

21. The advantage obtained from any facilities of construction of locomotives for a broad gauge must be set off against the corresponding facilities of construction of the road and works for a narrow gauge; and where the traffic is likely to be light and the cost of construction high in comparison to the net profits, the balance may readily rest with the narrow gauge line.

22. It would always be our wish to conform to the 5 feet 6 inches gauge, if the financial objections to it were not insuperable; but we shall hope to receive your approval to our considering it an open question, when the prospects of the returns from any contemplated system of lines are not satisfactory, whether such lines might not be contsructed on a narrow gauge, say 3 feet 6 inches instead of the ordinary broad Indian gauge.

The Duke of Argyll's despatch in answer to these despatches from the Government of India makes no direct reference to the question of gauge, but merely remarks, in assenting to the principles enunciated, that the Secretary of State "concurs generally in your reasoning, and in the more important conclusions at which you have arrived." A few months before this despatch was written, the Secretary of State had sanctioned the execution of a railway between Lahore and Rawalpindi as a State undertaking; and in this despatch he gave sanction to the commencement of a line down the Indus Valley, one from Delhi and Agra to the Sambhar Lake, another from Kulburga to Hyderabad (Deccan), and a fourth between Karwar and Hubli. It was on the question as to the proper gauge to be adopted on the Indus Valley and the Lahore-Rawalpindi lines that the battle of the Indian gauges was fought. As soon as the Secretary of State had given his sanction to the Government of India building its own lines of railway, Lord Mayo took up the matter in strong earnest. He wrote to America to obtain the services of an engineer who had had experience of the construction of light lines of railway, and a gentleman was selected and arrived in India.

From Secretary of State, No 42, dated 15th July 1869.

The question of gauge for certain lines was also immediately taken up. The propriety of adopting a narrower gauge, and thus reducing the first cost, for many branch railways, which were never likely to become through routes of communication, and the fact that lines on a gauge of 3′ 6″ had been adopted with more or less success in Norway, Queensland, Chili, and in the Madras Presidency, led the Government of India to think that such a gauge might well suffice for such branches as those from the main lines to the salt works at Sultanpur (near Delhi), to the salt works at Pind Dadan Khan in the Punjab, and for any lines that might be made in Burma. As sufficient information on the subject of cheap lines was not in the possession of the Government of India, the Secretary of State was asked to obtain the best professional opinions of the day on the whole subject. The brief was worded as follows:—

Despatch to Secretary of State, No. 111R., dated 16th October 1869.

> We do not desire that any absolute standard narrow gauge should be fixed, as the peculiar features of very difficult country may make such an extremely small gauge as that of the Festiniog Railway desirable in rare instances. At the same time, we are fully sensible of the disadvantages of a variety of gauges, even when the lines are not in connection, especially in the matter of obtaining stock and material; and we therefore should wish to ascertain what is considered by the highest authorities in England on such a subject to be the narrowest gauge compatible with carrying a passenger and goods traffic—say such as exists on an average branch line in England, at a speed of say 12 miles an hour—with efficiency and economy, the line being supposed to be constructed through country which presents no especial engineering difficulties and gradients not steeper than 1 in 100. Of course the economy of first construction must be duly considered and weighed against possible increased charge for working.

Before any report was received in answer to this request, the Government of India made a further representation to the Secretary of State, recommending the more extended use of a narrow gauge for railways in India, and making a distinct proposal that the Indus Valley and Lahore-Rawalpindi lines should be constructed on a gauge of not more than 3′ 6″. The most serious objections to the use of a narrow gauge which had been felt in times past were "based on the practical difficulties met with in the construction, working and maintenance, in the repair of engines, and in the economical designing and safe working of the vehicle stock." But these objections had been overcome; the evidence which the Government of India had collected of the working of narrow gauge lines in other countries, and the interesting reports on the Festiniog and on the Mid-Wales Railways which the Secretary of State had sent out to India, clearly showed that the above objections to a narrow gauge "have now been removed by the skill of the manufacturer, and there is abundant evidence to prove that a line can be

To Secretary of State, No. 51R., dated 17th May 1870.

To Secretary of State, No. 52R., dated 17th May 1870.

From Secretary of State, No. 23, dated 13th April 1870.

constructed and stocked so as to carry on a gauge of from 3′ to 4′ in width all the traffic that is likely to seek any of the secondary lines yet to be constructed in India, if not indeed the traffic of our trunk system.

The proposal of the Government of India was, therefore, to divide the railway necessities of the country of India into two classes, and make a broad distinction between the railways hitherto constructed and which formed a connected system of trunk lines along the great political and commercial routes, and those lines which were about to be taken up and which were of secondary importance in the network of railways designed to open out the resources of India. These secondary lines, as proposed, were very extensive, and formed systems in themselves; and believing that if built on a smaller gauge the demands for traffic would be amply met, and a large saving effected in the initial cost, the Government of India came to the conclusion that substantially built narrow gauge lines were all that were necessary. The following paragraphs of the first despatch (No. 51 Railway) above quoted give the views of the Government of India:—

7. In easy country the saving in first cost of a narrow gauge line, compared with a line on the standard gauge, will be comparatively small. But in difficult country this saving may be increased very considerably, in some cases enormously, by the adoption of steep gradients and sharp curves, which have an important bearing on the location, and therefore on the outlay on the formation. By their introduction deep cuttings and high embankments are avoided with the heavy works necessary for passing the natural drainage through the latter. We may eliminate the effect of the gradients from this discussion as applicable alike to all gauges; but the economy in construction resulting from the adoption of sharp curves in a hilly country will be generally admitted, though it must also be admitted that, with the introduction of specially constructed engines and vehicles, sharp curves can be combined with retention of a wide gauge. There can, however, be no doubt that the narrower the gauge, the sharper are the curves possible; for whatever special construction be applied to the rolling stock, it is applicable to the stock of all gauges alike.

8. Apart, however, from all question of the saving that thus admits of being directly estimated, we are of opinion that the practical declaration involved in the adoption of a narrow gauge, that we are determined in all things to suit ourselves to the requirements of the country, and not to waste a rupee in perpetuating a standard of railway in excess of these requirements, merely because it exists in certain parts where it may, or may not, be suitable, will lead to economies in many indirect ways, the aggregate of which will be important, and will contribute towards the earlier consummation of the extensions already admitted to be required.

9. Firmly convinced of the sufficiency of a narrow gauge to carry the traffic of our secondary lines, and fully satisfied that an important economy must ensue in the aggregate over the whole extension system, we should fail in our duty to India if we hesitated to advocate the adoption of gauge narrower than the present standard. Whether that gauge should be 3′ or 3′ 6″ is comparatively a matter of detail. As at present informed, we should regard 3′ 6″ as the maximum width that should be adopted. An early decision on the point is called for, so as to admit of timely arrangements being made for rolling stock, and we should be glad if Your Grace would determine it after communication with the best authorities on the subject.

The Government of India in this despatch clearly indicated its desire to have good substantial lines of a narrow gauge than to have light lines with slow speed on the standard 5′ 6″ gauge. Not that a high speed of 40 to 50 miles an hour drawn by heavy engines with a wheel-load of 7 tons was ever intended on the narrow gauge lines, but the Government of India thought that the lines should be substantial enough to bear locomotives with a wheel-load of 4 tons and to stand a maximum speed of 25 miles an hour.

Paragraph 10 of despatch No. 51 Railway runs thus:—

Your Grace (Duke of Argyll) will not have failed to observe that, thus far, we have kept the question of narrow gauge lines distinct from that of light and slow lines. Obviously they are distinct questions, and it would not be difficult to find a case in which it might be proper to avoid a break of gauge, and at the same time to ensure a large economy, by the use of light rails capable of bearing the vehicle but not the locomotive stock of the trunk lines combined with a slow speed. The advantage of being able to avail ourselves on such a line of the reserve of the vehicle stock of the entire trunk system to meet a sudden emergency on an exceptional traffic is indubitable; and to take a particular case, such as that of the Lahore and Peshawar line, would be so paramount as to forbid the adoption of a narrow gauge, unless in connection with a much longer length of line on the same gauge, the

stock of which could, on occasion, be concentrated, or in combination with a large reserve of stock which, till the emergency occurred, would be useless, and would represent a large unremunerative capital.

The Government of India proposed to make the whole length of line from Karachi to Lahore, and eventually on to Peshawar, on a narrow gauge. This involved converting about 319 miles between Karachi and Lahore, which was already opened to traffic, to the narrow gauge. The reasons adduced are given in the following extract from despatch No. 52 Railway, dated 17th May 1870:—

The present position of affairs is doubtless well known, but it will be convenient to describe it here. From Karachi to Rawalpindi a line of railway has been sanctioned, and there is little room for doubt that its extension to Peshawar will follow. The total distance by this route from the sea to Peshawar is 1,080 miles, of which 320 miles* in two sections, separated from each other by 500 miles, have been constructed and stocked on the standard gauge, and are now being worked. Of the intervening 490 miles, the section between Mooltan and Kotri of about 300 miles in length has been surveyed, and the estimates are now under preparation. Of the section from Lahore to Peshawar, construction is just commencing on the 100 miles between Lahore and Jhelum, on the understanding that the rails will be laid on the Trunk Road to the standard gauge; beyond Jhelum, as far as Rawalpindi, the surveys are approaching completion. Between Kotri and Mooltan, and between Lahore and Jhelum, the country presents no features which would demand, on the score of economy in location, the adoption of a narrow gauge in preference to the standard gauge. Beyond Jhelum the country is extremely difficult, and the improvements and diversions of the Trunk Road requisite to admit of rails being laid upon it must entail a heavy expense, which will be reduced the narrower the gauge and the sharper the curves adopted. In brief, the country is such as to indicate distinctly a narrow gauge for the 170 miles between Jhelum and Peshawar. Lahore, it should be added, is the north-west terminus of the standard gauge trunk lines from Calcutta and Bombay.

	Miles.
* Karachi to Kotri	105
Mooltan (Rajghat) to Lahore ...	214
Total ...	319

3. We have no hesitation in saying that were it a question of the section between Lahore and Peshawar alone, we should at once dismiss from consideration all idea of anything but a standard gauge line. The ordinary traffic on this route, with the exception of salt from the Pind Dadan Khan mines, is so small, that any railway of the smallest gauge or lightest rails would carry it. Commercially, the line has little to recommmend it. Politically, it is of the highest importance, and in consequence, may, on emergency, be exposed to the demands of a heavy extraordinary traffic. To adopt a different gauge then from the lines terminating in Lahore would involve the necessity of maintaining a large stock in inactivity, so as to be prepared for the emergency. This would be a constant source of outgoing, in addition to the loss of interest on the capital sunk.

4. The question has however presented itself whether, as the gap between Mooltan and Kotri of 500 miles has yet to be constructed, the necessary reserve of stock might not be secured by adopting a narrow gauge for that line. It is true that the country is such that the saving by the adoption of a narrow gauge line would not, as respects the reduction that may be feasible in the works, be so great as in other parts of the plains of India; but there can be no doubt that, in a sparsely populated country like Sind, every possible reduction in the amount of work to be executed should be taken advantage of. There would, however, be a saving which, over 500 miles, may amount, it is roughly estimated, to £200,000, apart from any further saving which may be possible in stocking the line, or by using a light description of permanent-way. The adoption of a narrow gauge on this gap would, however, necessarily involve the relaying of the Sind and, as far as Lahore, of the Punjab line on the same gauge. These lines are at present laid with rails of from 65 lbs. to 68 lbs per yard, chiefly on timber sleepers, about 70 miles of the Punjab line being on iron bowls. The rails are heavier than would be required for the improved stock of the narrow gauge, but, together with the stock at present working over them, can be utilised elsewhere. The consent of the Railway Company would, of course, be necessary; but looking to the probable diminution of their capital account that would result from the laying of these lines with the lighter rails, and to the obvious advantage of uniformity of gauge throughout the Indus Valley, we apprehend that a proposal to this end would not prove unwelcome. The first opportunity under the contract of Government purchasing these undertakings is as yet remote; but it might suit the shareholders to surrender them in anticipation if the proposal were not regarded with favor. The difference of value between the old and new rails and stock should more than cover the cost of relaying.

5. Believing, then, that, irrespective of any saving in first cost by the use of a lighter description of permanent-way, the adoption of a narrow gauge would lead to a large saving on the cost of the 170 miles of line north of Jhelum, to a by no means insignificant saving in outlay on 500 miles between Mooltan and Kotri; also that lighter rails on a narrow gauge may be substituted on the existing railways in the Indus Valley without

additional outlay, we would urge Your Grace to accept the recommendation contained in our telegram already referred to, that a narrow gauge should be adopted for the entire line of railway from Karachi to Peshawar. As a light description of permanent-way may be combined with a broad gauge, we have not adduced the saving from its adoption in support of the narrow gauge, but we may mention that we estimate the saving by the use of lighter rails at about £400 a mile over the 760 miles of new line to be constructed. With light rails on a broad gauge, special engines, it should be noted, would be required. The poor returns hitherto realised on the Sind and Punjab Railways and on the Indus Flotilla do not justify our forming any sanguine expectation of an early remunerative traffic on the Indus Valley Railway, even when completed so as to form a through line of communication, and afford an additional reason, if needed, for keeping down the outlay both on first cost and on working to the lowest possible limits.

On the 28th June 1870, probably after perusal of the above despatch, the Duke of Argyll sent the following telegram to Lord Mayo:—

I am carefully considering narrow gauge question. Many objections raised. What does Lord Napier think regarding Indus Valley line on military interests involved?

The answering telegram was sent on 9th July 1870, and was as follows:—

Lord Napier gives his opinion as follows:—'Because nearly one-third of the line from Karachi to Lahore is laid and working on the broad gauge; because of the comparatively easy country of the remaining two-thirds; and especially because of the advantage of accumulating rolling stock of other lines for military emergencies, I am in favor of completing the Indus Valley line with broad gauge.'—Opinion ends. Viceroy only remarks that if narrow gauge is built from Karachi to Peshawar, there will always be the rolling stock of the entire 1,100 miles available for emergency on any short section, such as that above Lahore.

Lord Napier also remarked in his note of 7th July 1870, from which the above opinion was extracted, that there was immediate necessity for a line of railway to Peshawar; and as he noticed that Lord Lawrence, in his scheme for the extension of railways, had put down the Peshawar line to be completed in 1885 and the Indus Valley line in 1890, added that—

rather than see such a fatal delay, I should submit to any minor evil, such as a break of gauge. For instance, a narrow gauge might, I believe, be laid on the Lahore and Peshawar road to complete the communication from Jhelum in one year without turning a spadeful of earth, and would pay its value in political security and economy of transport by the time the main line, according to the programme in Sir John Lawrence's Minute, would be advanced to that point, and it might either be retained or transferred for branch lines to our hill stations.

Note by the Governor General, dated 28th August 1870.

Lord Mayo did not think that the actual state of the case was quite before Lord Napier when he recorded the above note, so he put an explanatory note on record. He pointed out that no importance should be attached to the dates on the map accompanying Lord Lawrence's Minute; that the Indus Valley line had been recommended to the Secretary of State as one of the first which should be made; and "that the rapidity of railway construction can only be regulated in the first instance by the financial strength of the empire, and in the second by the power of organisation of establishment and labor" which it is possible to develop. Considering the extremely difficult nature of the country beyond Jhelum, and the resulting cost of a railway on the 5′ 6″ gauge, Lord Mayo also demonstrated that no line of railway ought to be made north of Jhelum which should be capable of carrying the stock of the East Indian or Delhi lines; and consequently "if a narrow gauge line is made the whole way from Karachi to Peshawar, the whole rolling stock of a line, 1,100 miles in length, will always be available for working on any portion of the system; and therefore the narrow gauge, constructed as suggested, will give a much greater facility for the transport of troops and military stores from Lahore to all parts of the frontier, north or south, over that of a line which would be composed in part of light broad gauge line."

The Secretary of State again telegraphed to the Viceroy that strong opposition was being shown to the narrow gauge as applied to strategical lines of railway, but that there was a general agreement to the narrow gauge when the strategical lines had been completed. He again asked if the Government of India had fully considered how far the standard 5′ 6″ gauge,

with a lighter rail, would be best for the Peshawar and Indus Valley lines. In reply to this, the following telegram was sent on the 5th October 1870 :—

The Punjab and Sind State Railways should in any case be laid with light rails suited to engines of moderate wheel weights, and the entire rolling stock should be capable of running from Peshawar to Karachi. The special engine stock will rule the transporting power of the line, whatever the gauge may be; and if light rails on standard gauge be adopted on northern and middle sections, we must provide new engines for whole length, otherwise efficiency of line on light sections, but particularly above Jhelum, will, on an emergency, be reduced by one-third compared with a line of uniform description throughout. For our views as to difficulty of country and character of line above Jhelum, see Railway Proceedings No. 44 for August. I consider every line now contemplated north of the Nerbudda in a great degree strategical.

Meanwhile, in accordance with the desires of the Government of India, the Secretary of State had nominated a Committee of Engineers to settle the actual width of narrow gauge lines which would be most suited to the wants of India. This Committee reported in September 1870, and the following summary of their proposals and of opinions of several of the Consulting Engineers to the London Boards of the Indian Guaranteed Railway Companies is extracted from Mr. Danvers' report on Indian Railways for the year 1870 :—

12. A Committee, consisting of Colonel R. Strachey, R.E., C.S.I., Colonel C. H. Dickens, R.A., C.S.I., Mr. John Fowler, C.E., and Mr. A. M. Rendel, Consulting Engineer to the East Indian Railway Company, was accordingly appointed "to consider the precise gauge and general character for and average narrow gauge line of railway in India." The result of their investigations and deliberations was given in two reports—one containing the conclusions at which all the members of the Committee, except Mr. Fowler, had arrived; the other expressing that gentleman's opinion alone. All, including Mr. Fowler, were in favor, on the ground of economy, of introducing a narrow gauge in India than the present standard of 5′ 6″ in districts where a break of gauge would not be productive of serious inconvenience, but they differed as to what that gauge should be. Colonel Strachey, Colonel Dickens, and Mr. Rendel recommended 2′ 9″; Mr. Fowler 3′ 6″. The opinion of the former was based upon the conviction that to obtain the greatest economy in construction, and consequently the greatest possible extension of railways in India, the gauge selected should be not only narrow, but the narrowest which would combine convenience of transport for various goods and passengers with reasonable speed, and with economy and safety in working, and they were persuaded that these conditions would be fulfilled by a 2′ 9″ gauge. Mr. Fowler, on the other hand, was of opinion that a width of 3′ 6″ should be adopted on the clear ground that it was not greater in first cost of works and rolling stock than a gauge of 2′ 9″, and was greatly superior in carrying capacity, convenience, and economical working. The other members of the Committee considered that the cost of a railway was in proportion to its gauge; he did not. He felt, to secure the greatest simplicity and economy of construction and working in a locomotive, a gauge of 3′ 6″ was required. They thought that engines of sufficient power might be put on a 2′ 9″ gauge to draw at a sufficient speed the largest traffic which the lines for which a narrow gauge is suitable are likely to carry. The same differences of opinion on similar grounds are expressed in regard to the rolling stock of the respective gauges. Opinions were also given on the subject by Mr. John Hawkshaw, as Consulting Engineer to the Madras and the Eastern Bengal Railways, and by Mr. G. P. Bidder, as Consulting Engineer to the Sind, Punjab and Delhi Railway. They are both opposed to the application of any other than the existing gauge to future lines which may be required as branches to extensions of the systems of railway with which they are connected. They attach great importance to the evils and inconveniences of a break of gauge, and contend that the very small saving, if any, which might be secured by the adoption of a narrow gauge would be more than counterbalanced by those disadvantages. Mr. Hawkshaw, however, admits in the early part of his report that if "it were a well ascertained fact that there are districts in India where, having regard to financial reasons, a railway on a narrower gauge could be made, but where a railway on the existing gauge could not and ought not to be made, then that would be a case in which a narrow gauge might be considered as an absolute necessity." He calculates, upon certain assumptions, that the difference in the first cost of a heavy railway on the 5 feet 6 inches and a light railway on the 3 feet 6 inches gauge would be £1,810 per mile, and that saving in maintenance and renewals of permanent-way would be £50 per mile per annum, or, if capitalised at twenty years' purchase, £1,000. He considers, however, that the object of economy would be best attained by constructing a lighter system of railways on the existing gauge, and calculates by this means £1,250 per mile might be saved in the first cost, and £40 per annum in maintenance, or £800 capitalised. Thus, under the least favorable view of the case, a saving of about £800 per mile is admitted. The case above described in Mr. Hawkshaw's words would probably be regarded as the rule, instead of the exception, for future lines in India. If ten thousand miles are to be laid out, economy must be observed in the construction of every mile, and a saving of £800,000 in every thousand miles, or of £8,000,000 in ten thousand miles, becomes a matter of importance.

13. A much greater saving, however, is expected by the advocates of the narrow gauge. I may mention, in passing, that the estimates for the Carnatic Railway, on the broad and narrow gauge systems, made by Mr. C. Douglas Fox, the Consulting Engineer to that Company, show a saving of £1,700 per mile in favor of the latter. The same capital would thus make 112 miles of the 5 feet 6 inches, or 151 miles of 3 feet 6 inches. I am informed also that in America 80 miles of a line which is to be 850 miles in length has been laid on a 3 feet gauge at a cost of £2,500 per mile, including rolling stock, the rail being 30 lbs. to the yard, joined by fish-plates; the sleepers pine wood, 5 feet long, set 2 feet 6 inches apart.

14. The existence of another gauge in the country necessarily complicates the question of introducing a narrow one; and in some places and situations the inconveniences of a break of gauge may be so great, or the value of a line of communication for strategical purposes may be so impaired by it, as to make it worth while to pay the difference in cost; but under ordinary circumstances these kinds of difficulties may be greatly reduced by improved mechanical appliances and good traffic arrangements. The condition of things, moreover, in this country, where, within short distances, and with an immense traffic, a break of gauge has been found to be most burdensome and objectionable, is very different from that of India.

The Duke of Argyll answered the Government of India in despatch No. 72, dated 26th October 1870. Notwithstanding the very decided proposals made by the Government of India to make the Indus Valley and Peshawar lines on a narrow gauge, and the recommendations of a Committee to adopt a gauge of 2 feet 9 inches, and of one member of that Committee to adopt a gauge of 3 feet 6 inches, the Duke of Argyll would give no definite orders as to the kind of railway to be constructed over those lengths, or as to the width of the narrow gauge if such be adopted; but he confined himself to expressing his agreement with the desire of the Government of India to study rigid economy in the construction of these new railways, and eventually concluded by leaving the main questions to be decided by the Viceroy, Lord Mayo.

From Secretary of State, No. 72, dated 26th October 1870.

This despatch is, however, a very important one in the history of the gauge question, and is given below *in extenso* :—

I have had under my consideration in Council Your Excellency's despatch of the 17th May, in which you recommend a narrow gauge for a large part of the contemplated extension of railways in India, and in particular for the lines beyond Lahore northward to Peshawar, and south-westward down the valley of the Indus.

2. As this proposal raises many questions of the most vital interest, I have taken time to give if may best consideration.

3. The objections to this proposal lie upon the surface. At home we are familiar with the inconveniences arising from a break of gauge. Our estimate of those inconveniences has been derived from our experience of an immense traffic carried upon lines which meet and cross each other in every possible direction, and within a very limited geographical area. The different circumstances of India are not equally familiar, but some of these differences, when remembered, may well be regarded as having an adverse, rather than a favorable bearing on the policy you recommend. It is urged that, whilst the evils of a break of gauge are great in respect of commerce, they are infinitely greater in respect to the military use of railways; that these evils would be specially felt upon the lines specified by you, which are lines mainly valuable for strategic purposes; that the great historical invasions of India have come from the North-West frontier, and that this is now the only frontier on which invasion by an enemy equipped with European appliances of war is possible; that the first object of railway lines to that frontier must be the military object, to enable the Government of India to move a large army rapidly to the front, with all its guns and materials of war. For this purpose an amount of accommodation is required which can only be secured by being able to command the rolling stock of all the lines already completed in India.

4. On the other hand, whilst the objections to your proposal are chiefly military, the arguments on which you rest that proposal are chiefly economic. You represent the narrow gauge as amply sufficient for the commercial traffic of the country, and as capable, under certain conditions, of supplying all that is really wanted for military purposes. Under these circumstances, you desire to secure whatever saving can be effected upon a narrow gauge in the cost of construction, working, and of maintenance.

5. Looking at the great questions of policy involved from these two opposite points of view, I have no hesitation in saying, in the first place, that, under the present circumstances of India, the military argument must be considered as secondary to the economic. The danger to our Indian Empire from financial embarrassment is a far more real and a

more pressing danger than the danger of sudden invasion on the North-West frontier by a great military power.

6. I observe in the second place that, even supposing this particular danger of invasion to be greater than I conceive it to be, it is a danger which has already, to a great extent, been met. Continuous lines of railway on the standard gauge have now been completed, which connect Lahore, the capital of our most northern province, with Calcutta on the one side and with Bombay on the other side of India. As much, therefore, of the rolling stock of all the lines now completed as can be used upon a single line of rail is now available for the concentration of troops upon the Punjab.

7. It is true that the communication with Bombay by Allahabad and the Jubbulpore junction is circuitous, as compared with a line down the valley of the Indus; but at the moderate speed of 15 miles an hour, Lahore is now within little more than 100 hours from either Calcutta or Bombay.

8. These considerations, however, may be regarded as proving too much—as proving that the great military lines being now complete, it would be best on economic grounds to stop the railway system at Lahore; and it is urged that, if any military value at all is attached to the extension of lines towards the North-Western passes on the one side and the sea at Karachi on the other side, it is unwise to make them upon a gauge which will be comparatively useless for military purposes.

9. As Your Excellency distinctly expresses a strong opinion on the political value of the Peshawar line, the argument I have just mentioned must have been fully considered by you, and you must have seen some sufficient answer to it. That answer will be found, I apprehend, in the nature of the military dangers to which we are actually exposed on our North-West frontier, which is not the danger of invasion by large and well appointed armies, but by the occasional incursions and disturbances of mountain tribes. It does not follow that a railway is useless for such military purposes, because it is not sufficient for the sudden transport of great masses of men, with all their material of war. The rapid or the more rapid movement than can be effected by marching of comparatively small bodies of infantry with a few mountain guns may be of the highest possible importance in preserving the peace of our frontier. Moreover, it may be fairly argued that, even as against a great military invasion of India, of which a few months' or even a few weeks' notice could be had, the narrow gauge lines would afford most important facilities for the concentration of our army.

10. I must add that I cannot regard the lines to Peshawar and down the valley of the Indus as valuable for military purposes alone. A high value is to be attached to such subsidiary lines in India in a commercial point of view, even although it may be many years before they become directly remunerative to the Government, considered merely as a shareholder. It is very difficult to estimate beforehand the amount of traffic they will create. But everywhere we may look with confidence to the effect they will have in enabling us to deal with the periodical miseries of famine, in raising the value of all agricultural products, and giving new directions to the ancient industry of the people.

11. So far, after the most careful consideration of the case, I entertain no doubt of the soundness of the general principle on which your recommendation is founded. That principle is the pre-eminent value, and indeed the absolute necessity, of the utmost possible economy in the execution of all our great public works. These must of necessity be provided for by loan, and the magnitude of the undertakings before us will involve of necessity a large increase of the public debt, the interest of which, until the works become remunerative, constitutes an annual burden on the revenues of the State. These revenues are already heavily weighted by this burden, whilst special difficulties appear to lie in the way of raising new taxes in India.

12. There is, however, one doubt affecting the application of the narrow gauge system to the Peshawar line and to the line of the Indus Valley, which I leave to the estimate you may form after a careful consideration of the documents I forward with this despatch. It cannot be denied that a break of gauge is in itself an evil and an inconvenience. It is an evil and an inconvenience which may be, and in the peculiar circumstances of India would certainly be, compensated by any very considerable saving in the economy of construction, of working, and of maintenance. But you will see by the papers accompanying this despatch that some authorities in England contend that, by applying a light permanent-way to the standard gauge, and running only at a low rate of speed, a large part of the economy you contemplate can be secured without any break in the continuity of gauge. That some considerable portion of the saving you contemplate can thus be secured, I have no doubt. But what balance of saving will still remain in favor of the narrow gauge as regards the cost of construction, and how much more of that saving will remain on the cost of working and of maintenance, are questions which must depend on the local conditions of country and of probable traffic. I commend these points to your closest investigation. That continuity of gauge with the rest of India would be an advantage in the Indus Valley line, the two terminal portions of which have already been completed on the standard gauge, is a proposition which can hardly be disputed; and if this advantage can really be secured at an inconsiderable cost, it may be well worth while to secure it. But I am unwilling, in the present condition of Indian finances, and in view of the great demands upon it which lie before us, to impose upon you any burden which you think you can avoid, and which I cannot defend as necessary to the accomplishment of the end in view.

13. I concur with you that whatever gauge is adopted for the line to Peshawar ought to be adopted on the Indus Valley; and as the traffic ought not to be interrupted on the two terminal portions of the Indus Valley line which are already completed, it will be necessary, if you decide in favor of the narrow gauge, to adopt the expedient of laying down a third rail upon those portions. The cost of this must be considered in estimating the question of comparative gain and loss, which I have left to your final determination.

14. Should a narrow gauge be determined upon, the further question what that gauge is to be is one of immense importance, because whatever gauge is fixed upon ought to be adopted in all the subsidiary lines over the whole of India. The economy which results from uniformity in plant and rolling stock makes this a matter of the first importance.

Memorandum by Lord Mayo, dated 30th December 1870.

The proceedings of the Government of India on receipt of this despatch are best summed up in the memorandum which Lord Mayo put on record, stating his reasons for adhering to the previous policy of the Government of India, and deciding that the Indus Valley and Peshawar Railways should be on a narrow gauge, and that the width of that gauge should be 3 feet 3 inches. The question of adopting in India a metrical system of weights and measures was then under discussion by the Government of India, and a draft Bill was actually before the Legislative Council. As the adopted gauge, 3 feet 3 inches, was so nearly the same as the proposed metrical standard, the narrow gauge for railways was changed very shortly afterwards from 3 feet 3 inches to 3 feet $3\frac{3}{8}$ inches, the length of a metre.

The following is the memorandum :—

We recommended the adoption of the narrow gauge from Lahore to Peshawar, mainly on the grounds that it would be possible to construct the whole line from Lahore to Karachi on this principle; this would ultimately make available the entire ordinary rolling stock of 1,100 miles of railway, which we conceive is amply sufficient for any military emergency.

The question, therefore, that we submitted to Her Majesty's Government was, whether it would be desirable to break the gauge between Mooltan and Kotri, it being assumed that, if this were decided in the negative, a narrow gauge railway northward from Lahore would not be recommended. After more than six months, the whole question is now returned to us for final decision. The result will be that some considerable delay must take place in the commencement of active work on the Lahore and Jhelum line. This cannot be helped, and it is now our duty to arrive at a decision as rapidly as possible and forward it to the Secretary of State. We should endeavour then to recommend the construction of such a railway as will be amply sufficient for all the requirements of the country, and be constructed at the lowest possible cost. Our decision in this will definitely fix what the Indian narrow gauge is to be.

The history of our Indian railways does not show that a sudden outburst of traffic can reasonably be expected, and we cannot anticipate in traversing less fertile and poorer countries than have hitherto been occupied by existing lines; the receipts we shall obtain in the first instance will increase in the same proportion as they occasionally do on American and European lines.

It is impossible to define with any degree of accuracy what the traffic on the new Indian railways is likely to be. The results of the Delhi and Lahore and Mooltan and Lahore lines are not encouraging, and I have no reason to suppose that they will suddenly improve. On the other hand, we must be certain that the railways we are about to construct will amply provide for all military wants and probable commercial requirements for a number of years.

I therefore asked the Council on our last meeting to consider whether we should adhere to our former recommendation, that a narrow gauge should be adopted between Lahore and Karachi on one side, and Lahore and Peshawar on the other. The Council having come unanimously to the conclusion that we should abide by our former recommendation, renders it unnecessary to discuss that question further. A similar conclusion was also arrived at with regard to the Rajputana and Central India lines.

It remains therefore only to consider what should be the dimensions of the narrow gauge line which it will be our duty now to recommend to the Secretary of State.

The great difference of opinion which exists between the high authorities who were consulted by the Secretary of State in this matter, as shown in the accompanying papers, involves us in much difficulty.

In considering unprofessionally such a subject, and in endeavouring to arrive at a sound conclusion as between the two narrow gauges recommended, *viz.*, 3 feet 6 inches and 2 feet 9 inches, we can only be guided by experience and authority. In this view there is no doubt that we should be quite safe in adopting the 3 feet 6 inches gauge; for it has been well and effectively tried, and is admitted to be sufficient for the conveyance of a large amount of traffic.

It is also a fact worthy of notice that those Governments and authorities who are now desirous of providing cheap narrow gauge railways, namely Russia Canada, Queensland, and Norway, have all adopted the 3 feet 6 inches gauge.

In Norway a railway of that dimension, 120 English miles long, exists, and it is generally admitted that it has proved to be completely suited to the light traffic of that country.

No such experience is available with regard to the 2′ 9″ gauge. The only line of any length of such small dimensions that I know of is the Festiniog Railway. This is a short line, 2′ gauge, with comparatively heavy rails, 49 lbs. per yard: it is worked in a hilly country under peculiar circumstances.

Therefore we have, as between a 3′ 6″ and a 2′ 9″ gauge, little or no practical experience to guide us. We know very little of the latter, but we know that the former has succeeded.

I have no means of showing very precisely the difference of cost between a 3′ 6″ and a 2′ 9″ gauge.

Mr. Fowler, in paragraph 24 of his letter, puts the difference of cost between a 3′ 6″ and a 2′ 9″ railway at £82-10 per mile for Scotland and £45 for Norway; for the Indus Valley he puts it at £45 a mile with iron and £110 with wooden sleepers; but he says that in consequence of the additional length and cost of siding which a 2′ 9″ gauge would require, the relative cost would scarcely differ. He further states that, with regard to bridges, the dimensions for the strength and stiffness required would always include the width of a railway of a 3′ 6″ gauge.

The weight of the rails would probably be the same. I am not an advocate of very light rails on any Indian railway, and would recommend a rail proportionately lighter than the 60 lbs. Oudh and Rohilkhand rail, which would be about 40 lbs. for a narrow gauge.

On the whole, therefore, according to the information at our disposal, I cannot put the difference of cost as between a 3′ 6″ and a 2′ 6″ gauge with wooden sleepers and say a 40 lb. rail at a greater amount than £100 a mile. This over the distance from Mooltan to Kotri and from Lahore to Peshawar, which is about 700 miles, makes only a difference of £70,000—a sum which is hardly to be regarded if very superior advantages can be obtained.

I have no reason to suppose that the working expenses of a 3′ 6″ or a 2′ 9″ railway would differ very materially.

The size of the carriages on the different gauges proposed is a matter of the first importance.

I assume that in most railways, and especially those of narrow gauge, the width of the carriage in the clear may be equal to double the width of the gauge.

I am not aware whether on any first class line carriages whose platforms are double the width of the gauge are actually at work; but Mr. Fowler appears to be of opinion, in paragraph 13 of his letter, that there can be no objection to a 3′ 6″ gauge bearing a carriage 7′ wide. But in none of the papers placed at my disposal does the possibility of increasing the breadth of the carriage beyond this proportion appear to be contemplated.

Whether it would be safe then to put a carriage 6½′ or 7′ wide upon wheel 2′ 9″ apart, or a carriage 8′ wide upon 3′ 6″ wheels, I can give no opinion which would be of value. This is a point for engineers to discuss, and one that I suspect nothing but practical experience would satisfactorily solve. I am not aware that the experiment has been tried, and certainly in ordinary conveyances steadiness could not be obtained under such conditions. I believe, therefore, that twice the width of the gauge is the limit of breadth in the construction of our carriages which we ought to recommend.

If we adhere to the principle that this limit ought not to be exceeded, it would take 6″ off the internal width of the vehicles and render a carriage of the 2′ 9″ gauge 5′ wide; of a 3′ gauge, 5′ 6″ wide; of a 3′ 3″ gauge, 6′ wide; and of a 3′ 6″ gauge, 6′ 6″ wide.

I am inclined to think that from 6′ to 6′ 4″ is the least width that can be conveniently given to a carriage to carry four passengers seated across. I put European and first class passenger traffic out of the question altogether. With 6′ 4″ you could get 19″ for four passengers in a row, which is one-fifth of an inch less than is now given to the new 3rd class carriages on the East Indian Railway, and which is not more than sufficient.

There is no advantage to be obtained either in gradients or curves as between any of the gauges. This, however, may be doubted as between a very broad gauge and a very narrow one; but certainly no increased facility in either gradients or curves is gained by a 2′ 9″ gauge over one of 3′ 6″ or 3′ 3″.

A very serious further objection which is urged to the very narrow gauge is, I believe that which is described in the 12th paragraph of Mr. Fowler's letter as regards locomotives. Mr. Fowler, who is a high authority on a practical question of this kind, states from experience that in order to secure the greatest simplicity and economy in construction and working, a gauge of 3′ 6″ is required for the engine.

He says that a locomotive may be constructed for almost any gauge, but that no locomotive, simple or strong, can be made with any great chance of success to work on a

gauge less than 3 feet 6 inches; and I may add, in confirmation of this opinion, that Mr. Fell told me in regard to his engines, the great mechanical difficulty with which he had to contend was the extreme narrowness of his gauge, which is 3′ 7½″: this obliged the mechanism to be compressed into so small a compass that, unless workmanship and material of the very first class were used, breakages were always occurring.

The defective character of his machinery, which was made in Paris, has been the greatest difficulty with which Mr. Fell has had to contend from the commencement of his enterprise. No undue weight, however, should be attached to this opinion, because the mechanism for working the central rail complicates the ordinary construction of the locomotive, and I am told that it has lately been found desirable to use two engines on Mr. Fell's railway, one for the central and the other for the outer rails. However, it must be recollected that Mr. Fell's gauge is 10½ inches wider than that advocated by Colonel Dickens and Colonel Strachey.

With regard to carrying capacity, it is affirmed by Mr. Fowler that a 3′ 6″ gauge has a carrying capacity of 63 per cent. greater than the 2′ 9″. I am not prepared to adopt this opinion without further proof, but still it is a statement gravely made on high authority.

It is said that even a 2 feet 9 inches gauge might be too much for the wants of the country, and that if a 3 feet 6 inches width were adopted, the stock would be little lighter than the existing stock of the East Indian Railway.

I cannot but think that the power of considerably increasing the carrying capacity of a railway is a great recommendation in its favor, because for the earlier periods of its existence it will be quite possible to build lighter and smaller vehicles than will ultimately be used.

But lightness is by no means regulated by gauge, and we can build as light a carriage on the standard gauge as on any other.

The weight of the carriage ought to be regulated, as nearly as possible, by the exact work it is expected to perform.

I think, therefore, these papers demonstrate that there is no important difference in cost between a 3′ 6″ and a 2′ 9″ gauge; that experience shows that a strong serviceable railway on the former size can be made with perfect success; that no difficulties with regard to locomotives are likely to occur; that its carrying capacity is considered much greater, and that, as far as passenger traffic is concerned, more comfort and convenience can be obtained than on the narrow line.

I cannot venture to say that the applicability of a railway to India on the 2′ 9″ gauge is disproved. Hereafter it may turn out that it deserves all that has been said of it. But, on the other hand, it must be admitted that weighty objections have been urged against it; whereas as regards the gauge 9 inches wider success is proved, and it is certain that it possesses requirements sufficient to provide for the locomotive wants of a country where a limited amount of traffic only can be expected, and considerable distances have to be traversed.

I confess I am unwilling to embark on anything in the shape of an experiment in a matter of such enormous importance. An error made now would be irreparable.

We must endeavour by every means to secure the most absolute certainty of success.

I have the greatest respect for the ability and judgment of the experienced engineers who have recommended the 2 feet 9 inches gauge, but the responsibility of selection now devolves upon my shoulders, and I am not prepared to recommend the adoption in India of any system which has not stood the test of experience, and is not supported by the almost unanimous opinion of skilled engineers.

I think, therefore, that the adoption of a 3 feet 6 inches gauge would be a thoroughly safe course for us to take; but if a 3 feet 3 inches one will provide for all the possible requirements of the country, I should prefer it. Some saving in cost would be gained. The small reduction in width could not affect the locomotive question, and a considerable economy of space would be obtained. This would give a carriage of 6 feet width in the interior, and would seat four third class passengers in a row, allowing 18 inches to each seat.

This is quite as small accommodation as, in my opinion, ought to be given, and I have some doubts whether it is quite sufficient.

On the Eastern Bengal Railway, the horse-boxes are 8 feet in the clear, 7 feet in the interior, divided into three partitions, two of 2′ 6″ and the middle one of 2′. This is, I think, too small.

The 3 feet 3 inches gauge would give, according to these proportions, a horse-box 6 feet 6 inches in the clear, and 5 feet 6 inches in the interior. This would give a space for two horses abreast of 2 feet 9 inches each (including the partition), which is precisely the space allowed on the horse-boxes of the East Indian Railway.

If, however, a great number of horses have to be moved in a short time, horse-boxes would be little used; and if a rapid transit is desired for military objects, the mainportion of the troopers must always be carried in ordinary goods wagons.

Six feet in the interior of a vehicle will be sufficient to carry gun-carriages for the heaviest artillery whose wheels do not, in scarcely any case, exceed 5′ 3½″.

For goods traffic, especially for the bulky goods, such as unpressed cotton, jute, &c., the additional space will be very valuable; and if a very small traffic is expected, short carriages can be used.

I incline that the opinion that the 40-lb. rail should be adopted, because it is the weight which experience shows has been most generally adopted for lines of this dimension and bears a fair proportion to the 60-lb. rails of the Oudh and Rohilkhand standard gauge. But at the same time I do not wish to say more than that, with three tons on the engine wheel and 2 tons on the wagon wheel, the rail should not be lighter than 36 lbs. to the yard. The final decision on this must be reserved until the precise character of engines and stock on each line is determined.

It appears that in such a country as the Indus Valley or Rajputana a railway of this kind ought to be built for less than £5,250 a mile, and according to Colonel Strachey for £2,645 less than the standard gauge with 60-lb. rails, or £1,707 less than the standard gauge with 45-lb. rails; and it is probable that as we gain experience, the cost might be considerably lessened.

According to the best consideration I can give to this extremely difficult question, I recommend the adoption of a 3′ 3″ gauge.

This decision as to the width of the narrow gauge, and as to the lines that were to be made on that gauge, was duly reported to the Secretary of State. These despatches stated that the Government of India generally accepted the views expressed by the Duke of Argyll in paragraphs 5 to 11 of his despatch* No. 72 Railway, dated 26th October 1870, "as to the main military and financial considerations that arise, and that we are satisfied that the economy likely to be obtained from the adoption of the narrow gauge will justify our accepting the break of gauge at Lahore with such inconveniences as it involves."

Telegram from Viceroy, dated 3rd January 1871.
Despatch to Secretary of State, No. 2R., dated 10th January 1871.
Despatch to Secretary of State, No. 3R., dated 10th January 1871.

* Quoted *in extenso* on page 228.

The matter had been left to the decision of the Governor General; and no sooner had Lord Mayo given his verdict in favor of the narrow gauge, than orders were issued that the Indus Valley Railway, the Lahore-Rawalpindi line, the lines in Rajputana from Agra and Delhi towards Ajmere, and the line from the Great Indian Peninsula Railway to Indore in Central India should be constructed on the narrow gauge. The section between Lahore and Jhelum had already been commenced as a light railway on the 5′ 6″ gauge, but the work had not progressed sufficiently far to cause any considerable alterations to be required for the narrower gauge. Surveys and estimates for the other lines were then proceeded with on the basis of the gauge being a metre; and the construction of the lines on that gauge was vigorously prosecuted.

During the year 1870 the London newspapers contained many proposals for narrow gauge and light railways, and many were the arguments brought forward showing their superiority over the ordinary standard gauges. In a report on the Festiniog Railway to the Secretary of State for the Colonies by Mr. G. L. Molesworth, who was at that time Director of Public Works in Ceylon, the merits and demerits of these lines were discussed. His conclusions were that the arguments claimed for the 2′ gauge of the Festiniog line were not borne out by the facts of the case, and that its superiority over the ordinary gauge of 4′ 8½″ under all circumstances was quite delusive.

The merits of narrow gauge lines were, however, from time to time still discussed in the newspapers; and when it became known that it was decided to construct the Indus Valley and the Lahore-Rawalpindi Railways on a narrow gauge, the outcry was great. First and foremost in vehemence against the decision was Mr. Lee Smith, the engineer who had been originally sent out by the Secretary of State to construct the Lahore-Rawalpindi Railway, but who had left the Government service before much advance had been made in the prosecution of the works; and the protests were continued by many

engineers of high professional standing in England. Mr. Lee Smith maintained that he could construct a light railway on the 5′ 6″ gauge from Kotri to Mooltan and from Lahore to Peshawar for a sum of money differing only very slightly from the accepted estimates for those lines on the metre gauge, and stated that a firm of contractors were prepared to carry out the works on the strength of his estimates. During 1872 considerable correspondence took place between Mr. Lee Smith and the Secretary of State, and this was transmitted to India for information. It was, however, not quite understood whether this correspondence was only sent for information, or whether the Secretary of State desired an expression of opinion from the Government of India as to the question of the break of gauge on the two railways. The Duke of Argyll, however, telegraphed that he had hitherto considered the question of gauge as settled, and deprecated any action which might unsettle that decision. The desultory discussion amongst the engineers in England, however, still continued; and as it was much desired to discuss the matter in a rational manner, the Secretary of State permitted the reading of a paper on the subject before the Institute of Civil Engineers. This paper, which was read on the 4th February 1873 by Mr. W. T. Thornton, C.B., the Secretary for Public Works at the India Office, stated simply and openly the reasons which led the Government of India to adopt a narrower gauge, and was followed by a lengthy, and at times acrimonious, discussion.

Despatch from Secretary of State, No. 122R., dated 9th October 1872.
Telegram to Secretary of State, dated 8th January 1873.
Telegram from Secretary of State, dated 13th January 1873.
Telegram to Secretary of State, dated 16th January 1873.
Telegram from Secretary of State, dated 31st January 1873.
Despatch to Secretary of State, No. 40R., dated 14th February 1878.

Lord Northbrook, Governor General.

No direct action was taken on this discussion, but it led shortly afterwards to a discussion on the same subject in the House of Commons; and although much difference of opinion was expressed during the debate, "Mr. Gladstone intimated that the arguments on both sides would be carefully examined in the light of the discussion, and in the light of such other facts and arguments as may be considered to bear upon the policy involved."

Public Works Department Proceedings, August 1873, Nos. 97 to 112.

In consequence of all this opposition to the change of gauge, and in conformity with the promise made by the Prime Minister in the House of Commons, the Duke of Argyll reviewed the whole state of the case in a lengthy despatch to the Government of India. In this review the Secretary of State showed that lines on the 5′ 6″ gauge connect the three presidency towns of India, and also are in connection with the principal centres of commerce in the Ganges valley and as far north as Lahore; that the amount of money sunk in guaranteed capital of railways was very large—nearly £94,000,000—and that the produce of the railways only returned a very small percentage on the outlay; and that as far as the commercial aspects of the districts round Lahore were concerned, it appeared that, Karachi being its natural outlet, a railway on the metre gauge would amply cope with commercial demands. But as far as the military requirements of the North-West frontier are concerned, the matter might now be different; it was on this aspect of the question that doubts of the soundness of the policy pursued had been raised. With reference to these arguments, and dismissing the question of danger in India from internal disturbance, the Duke of Argyll wrote:—

Despatch from Secretary of State, No. 54R., dated 27th March 1873.

From Secretary of State, No. 54R., dated 27th March 1873.

29. It is evident therefore that whatever special importance is attached in many minds to the adoption of the standard gauge beyond Lahore is connected with the special danger of invasion from without.

30. On this important part of the subject, the facts presented by the recent war in Europe have very naturally had a powerful influence on opinion. And I have no hesitation in saying that, if the circumstances of India were the same, or had even any analogy with the circumstances of France and Germany, the argument for uniformity of gauge would be conclusive.

31. I have therefore to direct your attention to the difference, amounting to contrast, which exists between the two cases.

32. All the leading States of Europe are in close contact with other nations having armies more or less equal to their own—possessing at least the same advantages of science, of organisation, and of speedy access to their mutual frontiers. The consequence is, that in all these cases great armies with powerful artillery can be placed at very short notice in a position to invade their neighbours.

33. Since the defeat and dissolution of the army which had been trained under Runjeet Singh, and the conquest of the Punjab, no similar conditions exist on our Indian frontier. There is no nation upon that frontier, or for many hundred miles beyond it, with any military science, with any trained or regular army, or with any artillery whatever.

34. I do not place out of view the possibility—although I do place it in a distant future—of a great European power organising offensive operations from beyond the North-West frontier. But even if such operations were possible at the present time, we may be sure of this, that no such invasion of India from that quarter could be effected without the threatened danger being known to us not only many weeks, but many months, before it could actually arise.

The conclusions arrived at by the Secretary of State were that a metre gauge railway from Karachi through Lahore to Peshawar would be amply sufficient for the trade of the country; that such a line would also suffice for all military demands in the event of a war on the frontier; and that consequently only weighty considerations of political necessity would induce him to reopen the question of the gauge of these frontier lines. The following are the concluding paragraphs of the despatch:—

37. In connection with such a system of narrow gauge lines, and a view to increase the amount of rolling stock available upon portions of it, it may be wise ultimately to lay down a third rail on the section of the trunk line between Lahore and Delhi, thus bringing into play the whole carriage accommodation of the projected Rajputana line. But even without this junction, the amount of rolling stock on the Indus Valley and Punjab lines alone would be sufficient, within very moderate limits of time, to afford the most important facilities for military movement.

38. It has indeed been argued, not unnaturally, that if the danger of invasion be really so slight and so distant, these frontier lines should not be made at all. But this does not follow. The time which would be ample for the working of a narrow gauge line, with even the narrowest estimate of accommodation, would not be adequate for the construction of any line whatever. Moreover, although an invasion requiring the concentration of great armies is a very remote danger, border forays and disturbances, and even incursions of a more serious character, are possible and probable enough. These, if unchecked and unpunished, are never without effect on the tranquillity of India. To meet these, the facilities which would be afforded by the narrow gauge in moving amply sufficient bodies of men are facilities so valuable and important, that we are bound to place them in the hands of the Government of India, if we can do so at a moderate cost.

39. These are the considerations which mainly determined my assent to the construction of lines in the Punjab and down the valley of the Indus; and I still regard them as sufficient, provided these lines can be constructed on the cheaper system now generally admitted to be suitable for subsidiary lines.

40. Your Excellency will doubtless bear in mind that the Khyber pass is not the only, nor even perhaps the most probable, direction in which the invasion of India by a large army would be attempted. If, therefore, this danger is to determine our policy, we must be prepared to extend the more costly gauge of railways to much more distant points, and indeed to construct the whole system of lines in connection with the Indus Valley on the same scale of outlay. If the cheaper gauge be adopted throughout, there will be no break of gauge beyond our military base throughout the whole Provinces of the Punjab and of Sind. But the evil of a break of gauge, whatever it may be, will at once arise unless the standard be adopted not only for the line to Peshawar, but for all other lines which may yet have to be constructed in those Provinces.

41. Your Excellency will also doubtless bear in mind that although attempts have been made to show that the expense of working and of maintenance on the standard gauge need not be materially greater than on the narrow gauge, yet these attempts must be regarded as based on the same methods of reasoning which you have rejected as regards the cost of construction. The additional capital which is sunk in construction is therefore only part of the loss which will be incurred. The dead weight arising out of annual loss on traffic will be heavily increased on lines which must be of a comparatively unremunerative character, and the difficulty you experience in diminishing expenditure, and in abstaining from new taxation, will be increased.

42. Lastly, looking to the many other lines into and through richer Provinces of India which are now competing for the favorable attention of your Government, but from which I have been obliged to withhold or to suspend my sanction until clearer evidence be forthcoming as to their remunerative character, I am bound to say that nothing, in my opinion, short of very

weighty considerations of political necessity would justify such a large increase of cost on the subsidiary lines as that which you report would be involved in a departure from the decision of Lord Mayo's government on the gauge of those lines.

43. Should any such considerations suggest themselves to your mind, I shall deem it my duty to weigh them carefully in Council. But short of such considerations, and on any mere balance of arguments less grave in character, I should be reluctant to reverse a decision which has not only been deliberately made, but has been already, to a large extent, acted upon, and any departure from which must involve such considerable sacrifices to the revenues of India.

That despatch was received in India in April 1873, and the position of affairs at the time was as follows. Considerable progress had been made on the Punjab Northern Railway on the metre gauge, and the girders for the bridges over the Ravi, Chenab, and Jhelum rivers were made for the narrow gauge. On the Indus Valley Railway work on the metre gauge had been progressing fairly well, and a good start had been made on the bridging of the flood openings required to pass the spill waters of the Indus. Also on both lines a large outlay had been incurred in permanent-way, locomotives, and rolling stock adapted to the metre gauge, and a good deal of this material was already in the country. No arrangements had been entered into or proposals made to the Sind, Punjab and Delhi Railway Company for the provision of a third rail along their line between Karachi and Kotri and between Mooltan and Lahore, so that, as far as was contemplated at that time, there would be a break of gauge at Kotri and another at Mooltan. Moreover, the contract with the Sind, Punjab and Delhi Railway Company was not determinable until 1885, so that any radical alterations of their lines could only be accomplished by arrangement.

The signatures to the despatch to the Secretary of State, No. 52 Railway, dated 17th May 1870, were those of Lord Mayo, Sir H. Durand, Sir J. Strachey, Sir R. Temple, Mr. J. F. Stephen, and Mr. B. H. Ellis; while the Viceroy and Council, to whom the question was now referred, comprised Lords Northbrook and Napier of Magdala, Sir R. Temple, Mr. B. H. Ellis, Sir H. Norman, Mr. A. Hobhouse, and Mr. E. C. Bayley.

In order therefore to have the question of gauge again thoroughly discussed from a military and political point of view, and quite independently of the commercial aspect, the opinions of the Commander-in-Chief and his military advisers were sought, as were also those of Colonel C. H. Dickens, R.A., then Secretary to Government of India in the Public Works Department, and of Mr. G. L. Molesworth, the Consulting Engineer to the Government of India for State Railways. All these opinions were attached to the answering despatch sent to the Secretary of State. As they, and more particularly the notes by Colonel Dickens and Mr. Molesworth, formed very important features in the correspondence, and serve to indicate the change of ideas regarding these frontier lines which was at work in the Government of India, it is necessary to give in some detail the nature of the arguments and opinions therein expressed.

Despatch to Secretary of State, No. 140 Railway, dated 19th July 1873.

The Commander-in-Chief was asked if the military considerations involved in making the Indus Valley and Punjab Northern Railways on the metre gauge were of such magnitude as to justify the Government of India to revert to the old 5 feet 6 inches gauge, and to incur the large and fruitless expense that such a reversion would involve. The superiority of the broad gauge for military transport purposes was at once admitted, but the Commander-in-Chief was asked to support his opinion with statistics giving the relative value of the two gauges for military purposes, and the effect of a break of gauge in the movement of such bodies of troops as Lord Napier might think likely to require to be moved in the case of war on the North-West frontier.

A practical example of concentrating 10,000 men and 36 guns was worked out by the Quarter Master General, and the relative capabilities of the broad and narrow gauge railways shown in an elaborate memorandum drawn up by Colonel F. Roberts, R.A., V.C. In forwarding

From Quarter Master General, to Government of India, Military Department, No. 2552, dated 13th June 1873.

this to Government, Lord Napier remarked "that the arguments and statistics contained in the memorandum not only conclusively prove the great advantage which the broad gauge possesses over the narrow for military purposes, but he believes moreover that they would even now justify the Government of India in undertaking the expense of a reversion to the 5½ feet gauge on both the Indus Valley and the Punjab Northern Railways."

It had been ordered that the Punjab Northern Railway should, as far as possible, use a portion of the grand trunk road north of Lahore, and the works then being carried out occupied a portion of that road almost continuously between Lahore and Wazirabad, a distance of 60 miles. Among other deductions drawn from the Quarter Master General's memorandum was the one "that if the narrow gauge be determined upon, the railway will be used almost exclusively for the transport of stores, &c., and the great mass of the troops will have to march: it is, therefore, most essential that they should be able to do so with speed and regularity." Consequently the Commander-in-Chief represented the vital importance of keeping the grand trunk road free for the movements of troops by route march. Quite apart, however, from the deductions drawn from Colonel Roberts' memorandum, the Government of India had already recognised that their original orders to lay important railways on existing roads required modification, as the existence of a railway did not do away with the necessity of parallel road communication: consequently this point was readily recognised and used in the answering despatch to the Secretary of State.

Report on the question of Gauge for the State Railways of India, dated 23rd June 1873.

The Consulting Engineer for State Railways also submitted an elaborate report on the whole question. Mr. Molesworth commenced his report with the remark that the adoption of the narrow gauge for State railways in India had been settled before his arrival in India, and that he had been informed that the question was not to be reopened. In an annual report he had, however, stated his "conviction that a break of gauge was a very serious evil, and that it should, if possible, be avoided; that a break of gauge was better than no railway; and that having adopted the narrow gauge, the more it is connected and extended into one large system, the less will its evils be felt."

Mr. Molesworth had before him the memorandum by the Quarter Master General (above referred to), and he showed the locomotives and stock designed for the metre gauge lines were little, if at all, inferior to the stock then running on English railways. Discussing the whole matter impartially, he arrived at the following conclusions:—

1*st*.—The capacity of the metre gauge stock is sufficient for all purposes of railway transport.

2*nd*.—The carriages and wagons on the metre gauge railway are nearly equal in capacity to the ordinary stock of English railways.

3*rd*.—The locomotives designed for *low* speed on the metre gauge are equal in tractive force to the large express engines designed for high speed on English railways.

4*th*.—The rolling stock for the metre gauge will be perfectly safe at a speed twice as great as that proposed for the State railways of India.

5*th*.—The metre gauge in my opinion is sufficient for all commercial and military purposes.

6*th*.—The cost of a broad gauge railway (60-lb. rails), with structures designed for the engines and other rolling stock of the Guaranteed railways, will (excluding very large bridges) exceed the cost of the narrow gauge by £1,650 or £2,000 per mile.

7*th*.—The cost of a broad gauge railway (45-lb. rails), with structures designed only for the carriage and wagon stock of the guaranteed railways (*but not for the engines*), will exceed the cost of a narrow gauge railway by £720 or £1,000 per mile.

8*th*.—The cost of a broad gauge railway (40-lb. rails), with structures designed for the same axle loads as the narrow gauge, will exceed the cost of a narrow gauge railway by £350 or £500 per mile.

9*th*.—The last of these three would practically be as great an obstacle to the interchange of traffic as if a break of gauge existed.

10*th*.—There will be no appreciable difference between the working expenses of the broad and narrow gauge railways.

11*th*.—The break of gauge in a commercial point of view, though an evil, is not one sufficient to justify the condemnation of the narrow gauge.

12*th*.—The break of gauge in a military point of view is a *very serious evil*.

13*th*.—A reserve of 1,000 vehicles will suffice for any military emergency on the frontier.

Mr. Molesworth then proceeded to discuss from a military point of view the several railways in Western India with reference to strategical positions. He recommended a comprehensive system of narrow gauge lines which would include the Punjab Northern, Indus Valley and Rajputana lines, and would necessitate the conversion to narrow gauge of the Sind, Punjab and Delhi and the Bombay, Baroda and Central India Railways. If such a system were adopted and a uniform policy kept in view, he considered that the adoption of the narrow gauge would be completely justified. But if, on the other hand, the Government should consider that such a comprehensive system was too remote or too difficult of attainment, and that the narrow gauge system would remain a series of railways isolated and disconnected, then he considered that the introduction of the metre gauge system was a mistake.

Mr. Molesworth showed by comparative estimates what it would cost to convert the works on the Indus Valley and Punjab Northern lines into broad gauge lines; also that, with a 45-lb. rail and a light class of engine, the conversion could be effected for an increase of about 15 per cent. on the estimated cost for metre gauge, and that in his opinion the maintenance of uniform gauge is worth that additional expenditure.

Colonel Dickens, the then Secretary in the Public Works Department, reviewed the whole case in a note, which was attached to the answering despatch. In this he stated his concurrence in most of the arguments which Mr. Molesworth has brought forward, and supported that gentleman entirely in the sufficiency of the metre gauge even for military operations. Colonel Dickens also added that "the cases which would attach to the delay of one day, which the break of gauge at Lahore would occasion, might be left out of consideration. But there are more weighty opinions on the opposite side, and by those he thinks the Government should be guided, seeing that if they err, they err on the safe side." He thoroughly approved of the decision to make narrow gauge lines, as the Government could not afford to enter on any general extension of railways without studying the greatest economy, and selecting the lines as to ensure a quick return for the outlay. But as regards the two particular lines in question, the Indus Valley and the Punjab Northern, his own opinion was against the change from broad to narrow gauge in 1870-71, not from any doubt as to the capabilities of the narrow gauge, but from the conviction that these two lines would be generally regarded as part of the trunk system of railways in India, and as important chiefly in view to political and military objects. If any military emergency, such as to call these lines into use under severe pressure, was really to arise, the break of gauge would be a very serious matter. And if no such emergency arose, the knowledge that there was such a serious obstacle to their use would detract from the moral effect of the works. These reasons were in his opinion sufficient at least to make these lines undesirable to select as the first to be constituted on the narrow gauge. It is true that the military communication would be the better for a railway on the narrow gauge than without any railway at all. But still the importance attached to the break of gauge, and the dissatisfaction with which a narrow gauge in such a situation would be regarded, seemed more than to balance the financial advantage.

Colonel Dickens also stated that having been absent on leave when the decision was come to, he had not had occasion before to express this opinion officially. Another reason which guided him in thinking that the Indus Valley line should be on the broad gauge was that already 324 miles out of the 814 between Lahore and Karachi were laid and working on the broad gauge; and it was only on the conversion of these parts into narrow guage that the line between Lahore and Peshawar was to be dependent for its extra rolling stock in cases of emergency.

Regarding the adoption of the 5′ 6″ gauge with lighter rails, Colonel Dickens remarked:—

> The adoption of the broad gauge with light rails and rolling stock would enable us to utilise much of the narrow gauge material, and would save time and money therefore. But if a change is made for military and political reasons, it should, I think, be thorough, and leave no doubt that these railways will be completely efficient and equal to all requirements of a military emergency, as much as the lines which are connected with them. In spite of all contrivances and precautions, I feel doubts of the possibility, under pressure of emergency, of keeping the heavy engines of guaranteed lines off the two lines in question; and to admit them would be to injure seriously these lines when most required to be efficient. If a change is to be made, therefore, I would adopt the 5½ feet gauge with a 60-lb. rail.

Colonel Dickens concluded his note thus—

If any military mishap should occur after the establishment on these lines of the narrow gauge, the Government would be said to have courted disaster. Nothing of the kind can be laid to their charge if they adopt the style of construction which has been in use in India heretofore to the satisfaction of the highest military authorities. Hereafter when the metre gauge shall have been tried and gained confidence, it may be quite proper to introduce it on the Indus Valley and Lahore and Peshawar lines. But for the present I come (very unwillingly, I confess) to the conclusion that the progress of the works should be so far delayed as to allow of the introduction of the 5½ feet gauge with the 60-lb. rail.

I think also that the occupation by the railway of the Lahore and Peshawar road should be given up. But the railway should be by no means taken to such a distance from the road as to be out of reach of easy military communication throughout the route.

The extra expense of the adoption of the broad gauge in this case Iwould regard as a military and political expense, and not as a part of the general system for the extension of railways in India.

	£
The extra cost of adopting the broad gauge with the 60-lb. rail instead of the narrow gauge with the 40-lb. rail is estimated by Mr. Molesworth at	1,536,200
To abandon the trunk road between Lahore and Jhelum, as well as between Jhelum and Peshawar, would probably cost ...	360,000
Total ...	1,896,200

But if the railway be terminated northwards at Attock, as I think it should be, the difference will be reduced by £171,500, leaving the extra charge to be incurred in round numbers at £1,700,000.

The interest on this sum is less than the cost of maintaining one regiment of European infantry.

These opinions were all duly weighed by the Government of India, and the Duke of Argyll's despatch, dated 27th March 1873, was replied to on the 19th July 1873.

Despatch to Secretary of State, No. 140 Railway, dated 19th July 1873.

The despatch was signed by all the Council, but in the opinions expressed they were not unanimous. Dissents against a new departure from the existing policy were recorded by Sir R. Temple, the Finance Member, and by the Hon'ble B. H. Ellis, the Member in charge of Public Works; and these dissents were sent home with the despatch.

The despatch commences by saying that the Government of India—

adheres to the views originally expressed, namely, that the economy which will result from the adoption of a narrow gauge in the case of a large proportion of the contemplated railways in India overweighs the disadvantages which accompany a break of gauge; and that although it may be expedient to adopt the 5 feet 6 inches gauge on a few of those lines, new railways in India should, for economical reasons, be generally constructed with the narrow gauge. Our opinion in this respect has been confirmed both by the satisfactory report which we have received of the experimental working of the State railway between Delhi and Rewari and by the general conclusions at which Mr. Molesworth has arrived after a careful comparison of the relative advantages of the broad and narrow gauge.

But Lord Northbrook did not consider that the question now at issue extended to the general suitability of the narrow gauge for State railways, but referred solely to the propriety to continuing to build the Indus Valley and Punjab Northern Railways on the metre gauge. A glance at the map of India was sufficient to show that a line of railway from Lahore to the sea at Karachi must be considered as one of the main trunk lines of India. That distance measured 814 miles, and of this distance 324 miles in two lengths, one at either end, were already built on the broad gauge and were in operation. It was originally proposed to convert this open length to the metre gauge, or to lay down a third rail for the passage of metre gauge vehicles, but this proposal is not dwelt on in this despatch, which only combats with the question of break of gauge. The despatch points that some of the highest military authorities took part in the discussion on the relative merits of the 5 feet 6 inches and smaller gauges at the Institute of Civil Engineers, and that they condemned a break of gauge on military grounds. The consensus of military opinion in India was the same. Also, although the Indus Valley would doubtless be of considerable

value for passenger and commercial traffic, its value for military purposes was of much more importance. The line from Lahore towards Peshawar, and which was already sanctioned as far as Rawalpindi, was designed entirely for military and political reasons; consequently the question of gauge of these lines was a matter which should be settled entirely on military grounds. On this evidence the majority of the Council agreed with the Viceroy in recommending that the 5 feet 6 inches gauge be adopted on these frontier lines, as that would settle for ever all difficulties as to a break of gauge at Lahore.

The despatch then goes on to discuss the relative merits of broad gauge lines with a 45-lb. and with a 60-lb. rail, and finally recommends the adoption on both the Indus Valley and Punjab Northern lines of a 60-lb. rail. The paragraphs recommending this are—

9. We are fully alive to the necessity of giving great weight to financial consideration in regard to the construction of railways and other public works in India, and we shall now proceed to show what additional cost will be incurred by adopting the broad gauge for the lines under consideration, and how the expense can be met.

10. Your Grace will find calculations of the cost of several alternative schemes for the broad gauge in Mr. Molesworth's report. A rail weighing 45 lbs. to the yard, which would take the rolling stock of the existing broad gauge lines, but would require special engines, might be used on one or both lines; or a rail weighing 60 lbs. to the yard might be used, which would carry both the rolling stock and engines of the broad gauge. Although a broad gauge line with 45-lb. rails would, to a considerable extent, obviate the disadvantage of a break of gauge, yet the inconvenience of different engines being required would be great, and we should much prefer the adoption of 60-lb. rails for both lines.

The estimated additional cost of construction caused by adoption of the broad gauge (60-lb. rails) for the Indus Valley line and for the portion of the Punjab Northern line for which estimates have been sanctioned, *viz.*, from Lahore to Jhelum, would, as compared with the narrow gauge, be £778,400. The increase of cost becomes greater for the difficult portion of the Punjab Northern Railway between Jhelum and Rawalpindi: it is estimated to amount to £454,000. From Rawalpindi to Attock the additional cost would be £126,560, and from Attock to Peshawar £177,160.

The total additional cost would be—

	£
To Jhelum	778,400
„ Rawalpindi	1,232,480
„ Attock	1,359,040
„ Peshawar	1,536,200

It may be assumed, from Mr. Molesworth's careful calculations and Mr. Fox's opinion given at the Institute of Civil Engineers, that there will be no difference in the cost of working the broad or the narrow gauge, and therefore that the above figures represent the whole additional expense which we should have to meet.

11. In considering the break of gauge, another question of importance connected with the Punjab Northern Railway has been brought under our notice by His Excellency the Commander-in-Chief; and that is, the partial occupation of the grand trunk road by that line. We are unanimously of opinion that it is necessary that the trunk road should be left free. The cost of the change is estimated as follows :—

	£
Lahore to Jhelum	100,000
Jhelum to Rawalpindi	130,000
Rawalpindi to Attock	85,000
Attock to Peshawar	45,000
Total ...	360,000

This expense would have to be incurred, whether the broad or narrow gauge be adopted for the Punjab Northern line.

12. If our views receive the approval of Her Majesty's Government, we would ask Your Grace to sanction a total additional expenditure of £1,232,480 for the adoption of the broad gauge (60-lb. rails) for the Indus Valley Railway and for the Punjab Northern Railway as far as Rawalpindi, and of £230,000 for the removal of the latter railway from the grand trunk road, making a total additional cost for the two lines of about £1,500,000, the interest of which at 4 per cent. would be £60,000 per annum, leaving the question of the extension of the railway to Attock and Peshawar for further consideration. Considering that the estimates for the two lines amount to nearly £6,000,000, we are of opinion that the additional expenditure which is required in order to render them thoroughly efficient for military purposes is amply justified by the circumstances of the case.

Sir Richard Temple dissented from this decision, because the evidence was quite conclusive in showing that the capabilities of the metre gauge were ample for all military requirements, and that it was very much cheaper to reduce the gauge of the open lines between Karachi and Lahore, or to lay down a third rail until those lines could be acquired from the Guaranteed Company.

The dissent of the Hon'ble B. H. Ellis is recorded in a powerful Minute, in which the whole tenor of the despatch is severely criticised. His reasons for dissent are summed up thus in his Minute :—

1*st.*—The despatch of the Secretary of State, to which this despatch purports to be a reply, has anticipated all the points now urged, and has not really been answered.

2*nd.*—Though Mr. Molesworth and Colonel Dickens are in accord with the despatch on the particular issue, the facts stated in their notes tend to show that the narrow gauge is efficient for all purposes, and greatly more economical than the broad gauge.

3*rd.*—The opinions of the military officers, quoted in the despatch, are not relevant.

4*th.*—The military objections based on the report of Colonel Roberts are overstated.

5*th.*—Substantially there will be no break of gauge seriously affecting military operations.

6*th.*—There are alternative suggestions for meeting the requirements of the military authorities in a less objectionable way than by incurring needless expense in constructing a broad gauge line, when a narrow gauge suffices for the traffic.

7*th.*—The additional cost of the broad gauge will be greater than is estimated in the despatch, and sufficient weight has not been given to the financial considerations involved.

Mr. Ellis laid great stress on the financial points, and warned his colleagues of the results likely to occur if the Secretary of State sanctions a change to the 5 feet 6 inches gauge on these lines.—

In the first place, it cannot be admitted that in this discussion it is only the gauge of the two railways specially named that is being discussed. I warn my colleagues who entertain this belief that the present movement is but the thin end of the wedge; and that if the Government give way on this occasion, the whole policy of the narrow gauge railways in India is imperilled. I know that it is even now sought to construct on the broad gauge the line from Gwalior to Agra, which forms a part of the Rajputana series of metre gauge lines connected with the narrow gauge terminus at Agra. I know also that an effort will be made to adopt the broad gauge on the line from Ajmere to Ahmedabad now under survey, this also being a part of the regular Rajputana series. Other lines will follow, and the result will be a number of isolated metre gauge lines, each of no great length; and when these are found to be unsuccessful, it will be asserted that the whole scheme was a mistake. But such a result may fairly be attributed, not to the policy itself, but to the divergence from that policy involved in the departure from its principles in individual instances as they occur.

This despatch was not answered until November 1873, and in the meantime, by the desire of the Secretary of State, the military aspect of the case had been reconsidered in England by General R. Strachey and Major E. C. S. Williams. The notes submitted by these officers were generally directed against the statements and conclusions drawn by the Quarter Master General in India as to the want of capacity of the metre gauge for military purposes.

The question of the change of gauge was a serious one and was discussed by the Cabinet. On the 18th November 1873 the Duke of Argyll telegraphed to Lord Northbrook—

Cabinet consulted gauge question. Unanimously, with me, in declining to expend million and a quarter excess beyond estimate for narrow gauge; but we will not overrule you if you determine after receiving our despatch to take standard gauge with 45-lb. rail, as Molesworth suggests.

A despatch to that effect followed immediately afterwards and reiterated the decision in the telegram. The Duke of Argyll remarks in this despatch that while—

From Secretary of State, No. 177R., dated 20th November 1873 (P.W.D. Proceedings, February 1874, No. 12).

the Government of India and its professional advisers are satisfied of the complete sufficiency of the narrow gauge, considered in itself, for all purposes both civil and military, * * * the only objections to adhering to the decision of the Government of

Lord Mayo as applied to the particular lines in question are, *first*, the inconvenience which may result from the occasional necessity of transferring troops and military stores from one set of conveyances to another; and *secondly*, the inconvenience which may arise from a supposed limitation of rolling stock.

As regards the want of sufficient stock for the metre gauge lines, the Secretary of State remarks that he has seen no evidence to convince him that the systems as proposed by Lord Mayo would not be supplied with as much stock as could be usefully employed. He considers the inconvenience of break of gauge much exaggerated; but as the Government of India attaches so much importance to this convenience from a military standpoint, he will not overrule that Government if it decides on the standard gauge with a 45-lb. rail, as suggested by Mr. Molesworth. And in conclusion, while agreeing to the policy of removing the Lahore-Rawalpindi line from off the grand trunk road, he remarks that—

it is not without the greatest reluctance that I shall advocate any further extension of the exceptionally broad gauge, which was adopted in India when very sanguine expectations were naturally entertained, but which experience has proved to be needlessly cumbrous and expensive for the traffic of the country. I should greatly prefer the other alternative, which is evidently regarded with favor, on its own merits, by Mr. Molesworth, namely, that of making the new narrow gauge system still more extensive and still more connected.

But, notwithstanding the fact that the Sind, Punjab and Delhi Railway Company had agreed to modify their engines so as to render practicable the Indus Valley Railway being made on the standard gauge with a 45-lb. rail, the Government of India decided not to adopt the broad gauge with a 45-lb. rail. The Government of India disclaimed that the question of gauge had been reopened at its instance; but since the Duke of Argyll had permitted its rediscussion, Lord Northbrook was now of opinion that it had been a mistaken policy to think of constructing either the Indus Valley or the Punjab Northern on the metre gauge, and that nothing short of the standard gauge with a 60-lb. rail would satisfy the exigencies of the case.

Telegram to Secretary of State of 18th December 1873.
Ditto from ditto of 2nd January 1874.
Ditto to ditto of 20th „ „
Ditto from ditto of 26th „ „
Ditto to ditto of 28th „ „
Despatch to Secretary of State, No. 7R., dated 16th January 1874.
(P. W. D. Pros., February 1874, Nos. 11 to 25).

The Commander-in-Chief, Lord Napier, was absent from Calcutta at the time this despatch was being discussed, and did not sign it, but his views were ascertained and embodied in the despatch. He gave his decided preference for the broad gauge with a 45-lb. rail; not apparently on the score of economy, from which standpoint the question was being fought, but because it ensured the broad gauge winning the day, as hereafter it would be an easy matter to change the lighter rail for a 60-lb. one when required.

Sir Richard Temple and Mr. Ellis still retained the opinions they had recorded as dissents from the previous despatch; and it was also stated in this despatch that "Mr. Hobhouse, who was unable to attend when the question was before discussed, is inclined to take the same view." The question of changing the gauge of these two lines to the standard gauge was therefore supported by Lords Northbrook and Napier of Magdala, Sir Henry Norman, and Mr. E. C. Bayley.

Apart from the gauge question, the Government of India showed in this despatch that the works on the Punjab Northern Railway had proceeded so far that it was much better to allow the metre gauge line, which had been laid along the side of the grand trunk road, to be finished and used as a temporary line, pending the decision of the gauge for the eventual line which was to be made off the road. To this the Secretary of State agreed, saying that "you may proceed at once with narrow gauge on Punjab Northern line. In a few days I shall tell you what I decide on the Indus Valley, if I decide at all." Mr. Gladstone's Cabinet resigned a few days afterwards, and Lord Salisbury took over the India Office portfolio on the 22nd February 1874; but in the interval between sending the above telegram and

Telegram from Secretary of State, dated 12th February 1874 (P. W. D. Proceedings, April 1874, No. 103).

the resignation, the Duke of Argyll gave his decision on the gauge question. He exonerated the Government of India regarding the reopening the question of gauge, but said it was necessary in order "to test the persistent representations of those who have contended that no great excess of cost is involved in the broad gauge." The Duke remarked that no less than three Members of the Viceroy's Council dissented from the views of the majority, and recorded his refusal to constructing these lines on the broad gauge in the following terms:—

Despatch from Secretary of State, No. 20R., dated 16th February 1874 (P. W. D. Proceedings, April 1874, No. 104).

9. Under these circumstances, Her Majesty's Government are of opinion that there is no sufficient reason for departing, at very considerable cost, from the careful and well-considered scheme of the late Lord Mayo's Government. That scheme will establish a cheaper system of railways commencing at Lahore and reaching from the extreme frontier of our dominions to the sea. There it will be in unbroken communication with a separate harbour of its own on the western side of India, and as easily accessible as Bombay by the shortest route from England.

10. The system of railways will be constructed on a gauge which, as shown by your Consulting Engineer, can easily be made to have a carrying capacity of the English standard gauge, and one sufficient for all purposes of railway transport. On the same authority, it appears that the rate of travelling can, with perfect safety, be made double that actually proposed for the State railways of India, and that in other respects it is sufficient for all purposes, whether military or commercial.

11. I have therefore to instruct Your Excellency to proceed with the scheme originally laid down by Lord Mayo's Government, and subsequently adopted under the authority conveyed by my despatch of 26th October 1870, No. 72.

12. You will consider carefully the detailed arrangements (many of which have been already suggested by Mr. Molesworth) which may secure the largest carrying capacity of carriage on the narrow gauge, and the greatest facilities in platform accommodation, &c., for transfer at the one great station, Lahore, where alone it will be required.

This was probably one of the last acts of the Duke of Argyll before leaving office, but the matter was evidently not considered as finally disposed of by that decision; for on the 21st March 1874 Lord Salisbury telegraphed to Lord Northbrook not to take the orders in the Duke of Argyll's despatch (No. 20) as final. But up to the 16th April 1874, when the Government of India forwarded to the Secretary of State a further memorandum on the question of break of gauge from a military point of view by Colonel F. Roberts, R.A., V.C., no further orders had been received in India. The gauge question was, however, decided early in June of that year, as the Secretary of State telegraphed on June 11th that the standard gauge and rails were sanctioned for the Indus Valley line; but it was not until the 25th June 1874 that Lord Salisbury signed the despatch giving definite orders on the subject. As this is the last of the despatches on the question, and records a very important decision, it may be as well to repeat it here:—

Telegram from Secretary of State, dated 21st March 1874 (P. W. D. Proceedings, April 1874, No. 105).

Despatch to Secretary of State, No. 68R., dated 16th April 1874 (P. W. D. Proceedings, April 1874, No. 112).

Despatch from Secretary of State, No. 92R., dated 25th June 1874 (P. W. D. Proceedings, September 1874, No. 2).

I have the honor to acknowledge the receipt of your despatch No. 68R., dated 16th April last, on the question of the gauge of the Punjab Northern and Indus Valley Railways.

2. I have carefully considered the memorandum submitted by Colonel Roberts, under the sanction of the Commander-in-Chief, in reference to the strategic disadvantage of a break of gauge.

3. It has more than once been pointed out to Your Excellency by my predecessor that the commercial prospects of this railway are not sufficiently favorable to justify any large expenditure, and that, even if designed on the most economical plan, it is not likely to repay the interest of the money expended in its construction. I have seen no arguments which would induce me to depart from his opinion on this point. But upon the military question it is not easy to find such certain grounds of judgment. The opinions advanced on opposite sides cannot be submitted to rigid calculation. They depend for their value, not merely

upon the reasoning by which they are sustained, but upon the authority of the persons who advance them. They cannot be adequately tested, except by those who possess an equal knowledge of military science, and are as closely acquainted with the detailed conditions of the problem under discussion.

4. I am disposed, therefore, to attach very great importance to the unshaken judgment of Lord Napier of Magdala upon this matter. He speaks upon the highest military authority; he is responsible for the defence of India, and his mind has been for some time past anxiously directed to the various strategic and geographical points on which this question turns.

5. Nor can I put aside the political considerations, which must press upon the attention of any one whose duty it is to consider the defence of the North-West frontier of India. It is not requisite that I should dwell upon them here in detail. They are doubtless present to Your Excellency's mind. They have increased in urgency since my predecessor last addressed you on this subject. It is only necessary to say that all the political and strategic considerations connected with this question are gaining, and not losing, value with the lapse of time and the progress of events.

6. On the other hand, I cannot conceal from myself that the financial objections, to which these strategic arguments are opposed, are themselves the subject of much uncertainty. At the highest, the economy to be secured by a break of gauge upon the frontier railway will not exceed £60,000 a year. But many great engineering authorities refuse to admit more than a third or quarter of the saving thus claimed, while some of the highest refuse to allow that there will be any economy at all.

7. Two considerable portions of the Railway, that is, to connect Peshawar with Karachi, have already been constructed by a Company, and their rights must be taken into account. If the narrow gauge is adopted, it will be necessary, in order to avoid three breaks of gauge, to relay upon that system the two broad gauge fragments which exist at present. The price that would be borne by these two fragments, if bought compulsorily, must be a matter of great uncertainty, and must add to the difficulty of relying on any important financial saving from the adoption of the narrow gauge in this case.

8. I have come to the conclusion that it would not be consistent with my duty to allow these uncertain financial expectations to outweigh the great strategic and political dangers which are constantly growing in importance, and which authorities so high as your Excellency and the Commander-in-Chief concur, with many others, in pressing upon Her Majesty's Government.

9. I have therefore to inform Your Excellency that the construction of the Indus Valley Railway from Kotri to Mooltan upon the standard gauge, and with the 60-lb. rail, is sanctioned. I should extend the same instruction to the railway from Lahore to Peshawar, if I did not gather from your despatches that the preparation for laying a narrow gauge railway between those points were more advanced towards completion. There appears to be some doubt whether an immediate change of gauge might not involve both a greater sacrifice of money and time than the advantages to be gained by it would justify. For the purpose of deciding this question, detailed information as to the progress of the works is necessary, which is only accessible in India. I leave it, therefore, absolutely to Your Excellency to decide whether the whole or any part of the line between Lahore and Peshawar shall be completed for the present on the narrow gauge. If considerations, derived from the advanced state of the works, should not, in your judgment, be of sufficient importance to influence your decision, this railway will be constructed on the same gauge as the Indus Valley line.

This despatch set at rest the question of gauge on these two lines; and not only have they been opened on the 5 feet 6 inches gauge, but important extensions to Peshawar, Khushalgarh, and to the foot of the Bolan pass are also either under construction or built on the same gauge.

During the year 1874 the question of gauge for the branch line from Agra to Gwalior was also under consideration. Mr. Ellis, the Hon'ble Member in charge of the Public Works, represented that this branch belonged to the Rajputana system of narrow gauge lines, that it would not be a paying line, and therefore had nothing in its favor to be considered as a trunk line. But the fact that Maharaja Sindia had promised to lend the Government of India 75 lakhs of rupees at 4 per cent. if the line was made; that he had expressed a desire to have the railway on the 5 feet 6 inches gauge; and that the Commander-in-Chief's representations that such a line

Public Works Department Pros., August 1874, Nos. 4 to 12; Public Works Department Pros., November 1874, Nos. 32 to 42.

was a strategical one and of great importance from a military standpoint, decided the Government of India to make this branch line on the 3 feet 6 inches gauge.

No further questions regarding gauge arose until the Government of India issued orders to commence the line of railway between Ahmedabad and Ajmere.

For several years before it had been the desire of both the Guaranteed Railway Companies, with termini in Bombay, to extend their ventures northwards, and get an entrance into the Gangetic Valley. The Bombay, Baroda and Central India Railway Company had even been permitted to make a series of surveys as far north as Agra and Delhi; and the Great Indian Peninsula Railway Company was desirous of extending its system into Malwa by means of a branch to Indore. The decision of Lord Mayo's Government to stop all further guarantees on the old system, and for Government to undertake the construction of its own railways, interfered with these proposals, as the construction of all railways through the States of Rajputana and Central India was considered a work which should be exclusively undertaken by Government.

Surveys between Ahmedabad and Ajmere were commenced by the Government of India towards the end of 1872, with a view to eventually running a railway on the metre gauge through that part of Rajputana.

The Government of Bombay, whose views on the subject had been invited, regretted that the line was not to be built on the standard gauge; but as a break of gauge had been determined upon, recommended that it should take place at Pahlanpur, and not at Ahmedabad, as the province of Guzerat was sufficiently fertile to demand a railway on the broad gauge. That Government also recommended that the section between Ahmedabad and Pahlanpur should be handed over to the Bombay, Baroda and Central India Railway Company to be built under their guarantee.

Public Works Department Proceedings, April 1874, Nos. 15 to 27, Part A.

The London Board of Directors of this Railway Company were also pressing their claims for extension northwards and objecting to any break of gauge; but they were informed by the Secretary of State, Sir Charles Wood, that it was not intended to deviate from the policy under which it had been decided not to sanction the extension of that Company's lines with guaranteed capital unless by the possible authorisation of short branches as feeders.

Public Works Department Proceedings, April 1874, Nos. 15 to 27, Part A.

In July 1874, after Lord Salisbury's decision to construct the Indus Valley line on the 5 feet 6 inches gauge, the Government of Bombay again strongly urged its views, to the effect that "it is imperative that the Ahmedabad and Ajmere line should also be laid on the broad gauge, if not as far as Ajmere, at least as far as the point which is best suited for the junction of any future Sind extension." The Hon'ble B. H. Ellis, before resigning his seat in Council, went over the projected line, and considered that there were no valid reasons for desiring to reopen the question of gauge for any part of this line. Consequently, in the despatch recommending the Secretary of State to give his sanction to lines from Ahmedabad to Ajmere and from Neemuch to Nasirabad, the question of gauge was not mentioned; the estimates were for a metre gauge line; those estimates were sanctioned, and orders were issued to construct the lines on the metre gauge.

Public Works Department Proceedings, November 1874, Nos. 200 to 210, Part B.

Despatch to Secretary of State, No. 30R., dated 3rd February 1876 (Public Works Department Proceedings, March 1876, Nos. 9 to 18).

Despatch from Secretary of State, No. 42R., dated 27th April 1876 (Public Works Department Proceedings, December 1876, Nos. 1 to 9).

But a feeling was growing up that the sanction between Ahmedabad and Pahlanpur might well stand the broad gauge. Owing to the failure of the south-west monsoon in 1877, severe famine was felt in Guzerat. The Minister of the Baroda State strongly urged the immediate construction of the section

between Ahmedadad and Pahlanpur on the broad gauge. This was recommended to the Secretary of State for acceptance, not only because the Baroda Railway could then work the section and so utilise its surplus rolling stock, but also because the Baroda State had contributed largely to a recent loan. The Secretary of State consented, and the earthwork and bridges on this section of the line were ordered to be made for a 5 feet 6 inches gauge. It was considered that this part of the line would probably form part of any line going towards Hyderabad in Sind; and the surplus engineers set free by the completion of the Indus Valley Railway were employed during the cold season of 1877-78 in running trial lines between Deesa and Sind. Sir Andrew Clarke considered that such a connecting link was absolutely essential for strategic purposes, and that it would soon have to be undertaken.

Telegram to Secretary of State, dated 6th August 1877 (Public Works Department Proceedings, September 1877, Nos. 166 to 173).

Public Works Department Proceedings, August 1878, Nos. 134 to 151.

It was, however, presently discovered that the Bombay, Baroda and Central India Railway Company had no powers to work any other line except their own; and that even if they obtained the requisite Parliamentary power, which they were anxious to get, they would want a large increase of stock to work the extension. Consequently, in May 1878, the Secretary of State asked by telegram if the Government of India was still of "opinion that the portion of the railway between Ahmedadad and Pahlanpur should be constructed on the broad gauge." This was not officially replied to until January 1879, when the Government of India reported that the orders regarding the construction of portion of the line between Ahmedabad and Pahlanpur on the broad gauge had been rescinded, and that now the whole line between Ahmedabad and Ajmere would be on the metre gauge. Difficulty had been experienced on the southern part of the line in brick-burning; and although the earthwork on the section to Pahlanpur was completed for a broad gauge line, little or no bridgework had been commenced; the additional expense due to the orders in 1877, when famine relief operations were needed, was consequently trifling. The following extract from the despatch gives the argument of the Government of India:—

Telegram from Secretary of State, dated 10th May 1878.
Telegram to Secretary of State, dated 24th May 1878.
(Public Works Department Proceedings, August 1870, Nos. 134 to 151.)

Despatch to Secretary of State, No. 24R., dated 24th January 1879 (Public Works Department Proceedings, February 1879, Nos. 76 to 90).

> Our reasons for accepting the alteration from the broad to the metre gauge, suggested by Your Lordship, between Ahmedabad and Pahlanpur, are, first, that the change will effect an immediate saving of some 12 lakhs of rupees; secondly, that it is better to have a break of gauge at a military station like Ahmedabad than at an outpost like Pahlanpur; thirdly, that the prospect of an extension towards Sind is remote, and that, even when the extension is taken up, it is probable it will be built on the same gauge as the Rajputana system, instead of on the broad gauge of the Baroda Railway; and fourthly, that, as far as can be judged at present, there are no reasonable grounds for apprehending that the metre gauge will not suffice to carry the traffic between Pahlanpur and Ahmedabad.
>
> 2. We are aware that the conclusion we have arrived at will be distasteful to the mercantile community of Bombay and also to the Baroda Railway Company. But the aim of the former is to convert the whole line from Ahmedabad to Delhi and Agra into a broad gauge undertaking, a result which could not be achieved without an expenditure of 2 or 3 millions sterling; while the object of the latter is to secure the control of the traffic working of the State Railway. Both parties are earnest in their conviction, that the interest of Bombay, as a seaport in competition with Calcutta, is injured by a break in the direct road to the North-Western Provinces, and that the existence of two gauges, with double proprietorship and management, will increase charges for transport, diminish conveniences for travelling, and cause delays in transmission of goods. We believe there is some exaggeration in these apprehensions, and that it would be unjustifiable for us, even if it were feasible under the financial existing circumstances of the empire, to expend in their removal 2 or 3 millions sterling.

To this despatch Sir Andrew Clarke recorded a dissent, as he believed that the econony could only amount to 6 lakhs, which was not commensurate with the advantages to be gained. He also pointed out that, in his belief, the traffic along the Rajputana Railway would be so great soon after its opening right through as to compel its conversion into the broader gauge at no very distant date.

The Bombay newspapers have, for many years past, given publicity to articles on the subject of gauge, and have persistently cried down the metre gauge, endeavouring to show that the adoption of any smaller gauge than the 5′ 6″ gauge was undesirable. Memorials on the subject also were frequent. In October 1875 the Bombay Government forwarded a memorial from certain bankers, traders, &c., residing in Surat and Broach for the immediate construction of the railway from Ahmedabad to Ajmere, and expressing a hope that immediate sanction would be accorded to the section between Ahmedabad and Pahlanpur being on the 5′ 6″ gauge.

Public Works Department Proceedings, October 1875, Nos. 303 and 304.

In September 1876, Mr. E. B. Carroll, the Locomotive Superintendent of the Bombay, Baroda and Central India Railway, printed a memorandum comparing the the narrow gauge Rajputana Railway with the other Indian railways on the 5′ 6″ gauge. This was duly forwarded by the Bombay Government to the Government of India, with a hope that the oft-repeated opinion of that Government for the 5′ 6″ from Ahmedabad northwards might receive full consideration. Mr. Carroll's memorandum was carefully examined by Mr. Molesworth and others, and the deductions were questioned. The Government of India did not, however, consider it worth while to take the matter up officially; but answers were published in the Roorkee Professional Papers, and an elaborate refutation by Mr. A. M. Rendel, the Consulting Engineer to the East Indian Railway Company, was forwarded to the Government of India by the Secretary of State. This was published as a Supplement to the *Gazette of India*.

Public Works Department Proceedings, January 1879, Nos. 34 to 54.

From Secretary of State, No. 103R., dated 24th July 1879 (Public Works Department Proceedings, September 1879, Nos 237 to 238).

In December 1876, Mr. Nowrosjee Pestonjee presented a memorandum on the importance of the Western Rajputana Railway to Lord Lytton while at Bombay on tour.

In April 1877, the Bombay Government forwarded a memorial on the question of the gauge of the Western Rajputana Railway from the Ahmedabad Association and the inhabitants of Guzerat and Kathiawar.

Public Works Department Proceedings, January 1879, Nos. 34 to 54.

On the 8th June 1877, the Bombay Chamber of Commerce memorialised the Secretary of State (Lord Salisbury) on the subject. A copy of the memorial was forwarded to the Government of India by the Government of Bombay.

Public Works Department Proceedings, January 1879, Nos. 34 to 54.

On the 29th August 1877, the Sheriff of Bombay convened a public meeting of the inhabitants of Bombay to protest against the construction of the Western Rajputana Railway on the narrow gauge. The speakers at this meeting adopted Mr. Carroll's pamphlet (above alluded to) as their text.

They adopted a memorial to Sir Richard Temple, the Governor of Bombay, and this was duly sent forward to the Government of India.

Public Works Department Proceedings, January 1879, Nos. 34 to 54.

In June 1878, the Bombay Chamber of Commerce again warmly returned to the subject, and submitted a comparison of the working of the Rajputana Railway with that of the older lines on the standard gauge, drawn out by the Chief Auditor of the Bombay, Baroda and Central India Railway Company. This also was forwarded to the Government of India, and the Government of Bombay asked that some definite reply to all these memorials might soon be given.

Public Works Department Proceedings, January 1879, Nos. 34 to 54.

Again in January 1879 the Government of Bombay submitted copies of further correspondence on the subject between that Government and the Bombay Chamber of Commerce, and also forwarded a copy of another memorial to the Secretary of State which the inhabitants of Bombay had adopted at a public meeting on the 21st February 1879. This memorial forwarded another pamphlet comparing the two gauges by Mr. Carroll, the Locomotive Superintendent of the Bombay, Baroda and Central India Railway Company—a comparison showing a strong bias in favor of the broader gauge.

Public Works Department Proceedings, June 1879, Nos. 175 to 188.

All these petitions had to be carefully considered, and were the cause of delaying the prosecution of work on the southern portion of the Rajputana Railway. However, as before stated, the Government of India had decided in January 1879 that the whole line from Ahmedabad northwards should be built on the metre gauge. Regarding the memorials from Bombay to the Secretary of State, Lord Lytton telegraphed as follows :—

Despatch to Secretary of State, No. 24R., dated 24th January 1879.

Telegram to Secretary of State, dated 14th April 1879.

Rajputana Railway. * * * There is no necessity for postponing your orders on Bombay memorial. It contains nothing new, and I have nothing further to say. General Strachey can fully explain grounds of decision, reported in our despatch of 24th January. Sir A. Clarke, retaining opinion that whole line from Ahmedabad to Delhi must ultimately be converted to broad gauge, recommends that memorialists be told that the under works of the line to Ajmere not yet built will be made for a broad gauge; and that, though it is now necessary to continue to lay down the metre gauge so as to ensure earlier establishment of through communication, this course will expedite the conversion into broad gauge, should such a measure be finally decided upon. This course will, he thinks, involve no great immediate expenditure. My own opinion is, that no futher expenditure of any kind should be allowed beyond what is unavoidable for making the narrow gauge line efficient.

In confirming the orders of the Government of India to make this line throughout on the metre gauge, Lord Cranbrook replied as follows :—

Despatch from Secretary of State, No. 53R., dated 24th April 1879 (Public Works Department Proceedings, June 1879, Nos. 175 to 188).

Your Railway letter No. 24 of 24th January last, and your subsequent telegrams of 9th and 14th instant, inform me that the prolonged deliberations of Your Excellency in Council as to the most suitable gauge for the Pahlanpur section of the Western Rajputana State Railway have terminated in selection of the same metre gauge as had been already adopted for the rest of the line.

2. This choice was not, indeed, altogether unanimous, having been dissented from by the Member of your Council having charge of Public Works; nor can it fail to be viewed with disfavor by a considerable portion of the commercial community of Bombay. But although much may, no doubt, be said on both sides, the balance of argument seems to me to be strongly in favor of the course on which your Government have finally decided. I confirm your decision the more readily, as, among other recommendations, it will have that of effecting an immediate saving of 12 lakhs.

3. It is satisfactory that the question which has hitherto so much retarded progress has at length been set at rest; and it is hoped that every endeavour will now be used to complete the line as early as possible.

The Secretary of State, in replying to the memorials from the inhabitants of Bombay, sent a copy of the foregoing despatch for information; and, while regretting that his decision was adverse to their wishes, added that "the selection of the metre gauge for the line of railway in question was not made without careful consideration by Her Majesty's Government, as well as by the Government of India, of all the circumstances of the case; and my conviction of its propriety remains unchanged."

Public Works Department Proceedings, June 1879, No. 188.

The question of gauge on the Rajputana system of railway was thus set at rest; works for the metre gauge were prosecuted with vigor, and the line was opened throughout on the 1st January 1881.

A few notes on the gauge question as it has affected the Australian Colonies may not be out of place here.

The Royal Commission appointed to consider the question of break of gauge in England made its report in 1846; and in that year Mr. Gladstone, the Secretary of State for the Colonies, recommended that, in the event of railways being made in the Australian Colonies, they should all be constructed on the 4′ 8½″ gauge.

As early as 1848, some railway projects were brought forward for construction in the Colony of New South Wales; and being referred to the Home Government, Lord Grey applied to the Commissioners of Railways to state what gauge would, in their opinion, be most advantageous to Australia. The reply was the 4′ 8½″ gauge; and Lord Grey in consequence pressed on all the Colonies the adoption of that gauge.

In 1850, the Sydney Railway Company strongly recommended to Sir Charles Fitzroy, the Governor General of New South Wales, the expediency of adopting a gauge of 5′ 3″; arguing that, as that line would be the alteration constructed in Australia, a timely notification to the other Colonies of the alteration would prevent any inconvenience which might otherwise arise from such alteration. This question was again referred to the English Railway Commissioners; but as they had no particular reasons to press a gauge of 4′ 8½″ on the Australian colonists, and as it was opposed to the wishes of the colonists, the change of gauge to 5 feet 3 inches was sanctioned by the Home Government.

An Act of the Legislature of New South Wales was accordingly passed in 1852, providing that all railways in that Colony should be constructed on the 5′ 3″ gauge. This Act received the royal assent, and was transmitted to the Governors of Victoria and South Australia for guidance.

In 1853, the Sydney Railway Company having changed their engineer, altered their views on the subject of the gauge. An application to this effect was made to the Governor General, and having been considered by the Legislature, the Act fixing the gauge at 5′ 3″ was repealed, and another passed making the gauge of 4 feet 8½ inches imperative throughout that Colony.

As these proceedings were at variance with those which had been taken by the Railway Companies in Victoria, and who had already ordered rolling stock adapted to the 5′ 3″ gauge, a strong remonstrance was made to the Colonial Office by the Governor of the Colony against such a vacillating course of legislation. The remonstrance was not successful, and the royal assent was given to the Act ordering that a gauge of 4′ 8½″ be adopted throughout the Colony of New South Wales. This is the gauge that has since been adopted throughout that Colony.

In consequence of these proceedings in the Legislature of New South Wales, a Select Committee of the Legislative Council of Victoria was appointed in September 1853 to take evidence and report upon the best gauge for railways in that Colony. The opinion of this Committee being conclusively in favor of the 5′ 3″ gauge, that gauge has been recognised and acted upon as the standard gauge for Victoria.

The South Australian Legislature adopted the 5′ 3″ gauge as the standard gauge for that Colony; the gauge in Queensland is 3′ 6″. Thus it will be seen that already in Australia they have three different gauges. Of late years railway communication has rapidly extended, and as through railway communication may soon be established between Melbourne and Sydney, the colonists are likely soon to feel the inconvenience of a change of carriage at the frontier.

The discussions that had taken place in the English papers about the year 1870 again led to the question of gauge being seriously discussed in the several Colonial Legislatures, and Commissions were appointed to study and report on the question. No changes, however, were recommended in any of the Colonies.

The inconvenience of break of gauge will, however, probably be felt less in Australia than in many other parts of the world. Speaking generally, the interior of the country is unsuited for agricultural purposes; and as the probabilities of many points in the interior becoming the centres of manufacturing industry are remote, there cannot be more than a sparse population for many years to come; consequently the traffic on the railways will be limited to the conveyance of pastoral produce from the interior to the seaboard, and of provisions and other supplies to the pastoral districts of the interior. Moreover, the Colonies having fenced themselves with heavy protective duties, there will be little or no cross country goods traffic between them, but the goods traffic in each Colony will find its entrance and exit through the seaports of the Colony interested. The small passsenger traffic that will be interchanged between the Colonies will therefore be the only traffic that will be inconvenienced for the present by the breaks of gauge that are imminent in Australia.

CHAPTER VII.

STORES.

THE operation of the State Railways Store Department for 1880-81 may be summarised as follows:—

The value of stores of each class contracted for in England was—

Contract price of stores.	A. Bridge work.	B. Engineer's plant.	C. Workshop machinery.	D. Permanent-way.	E. Rolling stock.	F. Station materials.	G. Tools and stores.	Grand Total.
	£	£	£	£	£	£	£	£
From 1st April 1880 to 31st March 1881.	53,130	6,305	75,594	103,040	276,706	32,125	25,265	572,165

The number and tonnage of ships which brought State Railway stores to the several ports were—

Memorandum showing vessels arrived and gross tonnage received at ports.	Calcutta.		Bombay.		Karachi.		Madras.		Total.		Rangoon.		Grand Total.	
	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.	No. of vessels.	Gross tonnage.
From 1st April 1880 to 31st March 1881.	71	9,250	108	51,720	82	95,830	29	3,460	290	160,260	7	30	297	160,290

The stores for the strategic lines of the Punjab frontier were brought from 1st April 1879 to 31st March 1880 in 22 vessels aggregating 32,100 tons, and from 1st April 1880 to 31st March 1881 in 65 vessels aggregating 83,105 tons. The largest consignments went to Karachi. The pressure on the very limited resources of this port was very great. The following stores were landed in each month at Karachi:—

Month.		No. of vessels arrived.	Gross tons of stores landed.
April	1880	7	8,913
May	"	8	15,461
June	"	5	8,376
July	"	9	16,741
August	"	3	1,906
September	"	8	8,746
October	"	6	16,743
November	"	1	22
December	"	4	2,287
January	1881	1	23
February	"	6	1,364
March	"	7	2,523
	Total	65	83,105

The progress made in the supply of rolling stock is shown in the following statement:—

Shops.	Second quarter of 1880.			Third quarter of 1880.			Fourth quarter of 1880.			Totals for three quarters of 1880.		
Metre Gauge.	L.	C.	G.	L.	C.	G.	L.	C.	G.	L.	C.	G.
Nagpur	...	...	129	2	...	59	...	...	81	2	...	269
Howrah, East Indian Railway ...	...	32	...	...	30	30	...	11	30	...	73	60
Ajmere, Rajputana State Railway	8	15	...	...	5	36	...	24	149	8	44	185
Parel, Bombay, Baroda and Central India.	...	14	...	...	6	...	...	16	...	...	36	...
Khandwa	...	...	8	6	...	2	8	5	23	14	5	33
Lucknow, Oudh and Rohilkhand...	...	30	...	10	6	78	...	11	72	10	47	150
Somastipur	...	...	8	...	...	12	...	...	...	...	...	20
Bhavnagar	4	3	...	...	...	...	4	42	34	8	45	34
Sara	3	...	...	4	...	...	...	...	...	7	...	...
Burn and Company, Calcutta ...	...	...	25	...	...	...	...	...	...	...	...	25
Saidpur	...	...	...	...	...	1	...	2	...	...	2	1
Sabarmati	...	...	...	1	...	...	9	...	20	10	...	20
Purchased from Lower Ganges Canal	...	...	...	1	...	...	...	...	...	1	...	...
Total ...	15	94	170	24	47	218	21	111	409	60	252	797

Shops.	Second quarter of 1880.			Third quarter of 1880.			Fourth quarter of 1880.			Totals for three quarters of 1880.		
5′ 6″ Gauge.	L.	C.	G.	L.	C.	G.	L.	C.	G.	L.	C.	G.
Ahmednagar	...	1	...	...	6	31	...	11	136	...	18	167
Eastern Bengal Railway, Kanchrapara.	...	4	...	...	...	...	...	6	...	...	10	...
East Indian Railway, Howrah ...	...	10	...	...	14	...	...	...	...	...	24	...
Burn and Company, Calcutta ...	...	...	...	...	...	...	...	10	...	...	10	...
Sind, Punjab and Delhi, Karachi...	10	8	7	11	...	41	9	1	115	30	9	163
Adamwahan, Indus Valley Railway	...	...	55	...	8	24	...	...	2	...	8	81
Parel, Bombay, Baroda and Central India Railway.	...	...	48	...	8	16	...	8	34	...	16	98
Warora	...	...	...	...	...	...	...	...	60	...	...	60
Total ...	10	23	110	11	36	112	9	36	347	30	95	569

Metre Gauge Stock put on Lines.

	Engines.	Coaching vehicles.	Goods vehicles.
Up to 31st March 1880	259	840	4,646
Up to 31st December 1880	319	1,148	5,386
Difference ...	60	308	740

Metre Gauge Stock under erection on 31st December 1880.

	Engines.	Coaching vehicles.	Goods vehicles.
In all workshops	35	357	669
Total put on lines and in workshops on the 31st December 1880	354	1,505	6,055

Broad Gauge Stock put on Lines.

	Engines.	Coaching vehicles.	Goods vehicles.
Up to 31st March 1880	158	570	3,094
Up to 31st December 1880	188	704	3,624
Difference ...	30	134	530

Broad Gauge Stock under erection on 31st December 1880.

	Engines.	Coaching vehicles.	Goods vehicles.
In all workshops	12	23	372
Total put on lines and in workshops on the 31st December 1880	200	727	3,996

The above figures do not include the following metre gauge stock in Burma and the North-Western Provinces on the 31st December 1880 :—

	Engines.	Coaching vehicles.	Goods vehicles.
On Rangoon and Irrawaddy Valley Railway	31	199	636
On Muttra and Hathras Light Provincial Railway	5	32	75
Total ...	36	231	711

The total value of stores purchased in India by the State Railway Storekeepers at the ports of Bombay, Calcutta, and Karachi during 1880-81 was Rs. 29,73,062. Of this sum, about Rs. 12,50,000 was for English coal and for oil, timber, and other articles of indigenous origin. The balance of Rs. 17,23,000 was for metals, hardware, and other European stores.

The Store establishments were reorganised during the year by bringing into Class III of the Superior Revenue Scale the three Port Storekeepers and the Stock Verifier, with a special allowance to the latter and to the Storekeepers at Calcutta and Bombay, and into Class III and IV the other officers required for open lines; the remaining officers being brought into classes C, D, E and F of the Subordinate Revenue Establishment. Seven officers who were in excess of the requirements of the State lines were retired. For the purposes of promotion, the Storekeepers are to remain on one list, and their numbers will vary with the amount of work required.

CHAPTER VIII.

DETAILS OF THE PRINCIPAL RAILWAYS IN INDIA.

BROAD GAUGE.

1. *East Indian.*—This line extends from Calcutta (Howrah) to Delhi, and has a branch of about 224 miles from Nynee, near Allahabad, to Jubbulpore, and several shorter branches, aggregating 82 miles, none of which exceeds 27 miles in length. The stations of Kanoo and Luckieserai are also connected by a loop line, 250 miles in length, which formed at one time the main line of the system and followed the windings of the river Ganges. It is in junction with the Sind, Punjab and Delhi Railway at Ghaziabad, with the Great Indian Peninsula Railway at Jubbulpore, with the Oudh and Rohilkhand Railway at Aligarh and Cawnpore, with the Sindia State Railway at Agra, and with the Patna-Gya State Railway at Bankipur; all of these lines are on the broad gauge. It also exchanges traffic with the Oudh and Rohilkhand Railway across the river Ganges *viâ* Benares, where a connecting bridge is now being built. Its junctions with narrow gauge lines are at Nalhati, Cawnpore, Agra, Hathras Road, and Delhi; it is also connected with the Tirhoot State Railway by a short branch and ferry at Barrh.

The Railway has a double road for 411 miles.

There are 158 stations at an average distance apart of 9½ miles, and these are engine stations.

Construction was commenced in January 1851, and the first section, 23¼ miles from Howrah to Hooghly, was opened on the 15th August 1854. The line has been open throughout its whole length since January 1871.

The earthwork and bridges generally are for a double line, except the superstructure of large bridges. The road consists of double-headed rails, varying in weight from 74 to 82 lbs. per yard, carried on cross-sleepers, for the most part of wood and a small proportion of iron. Steel rails are being used for renewals where the traffic is heavy.

2. *Eastern Bengal.*—This line extends from Calcutta (Sealdah) to Goalundo on the bank of the Ganges near its confluence with the Brahmaputra. It has a branch 4 miles long to Kooshtea, also on the right bank of the Ganges and some 45 miles up-stream from Goalundo. There is also a short branch 2 miles long to Chitpore, where junction is effected with the Calcutta Port Trust Railway. There is a connection with the Calcutta and South-Eastern State Railway at the terminus Sealdah. From Poradaha at the 103rd mile there is a State branch, worked by the Company. This branch is 13 miles long and extends to Damukdea on the Ganges, whence it is connected with the Northern Bengal State Railway by a steam ferry.

The Railway is laid with a single track throughout. There are 32 stations at an average distance apart of 5 miles and 4 engine stations. Construction was commenced in April 1859, and the first section (45¼ miles) from Calcutta to Ranaghat was opened in September 1862. The second section (62 miles) to Jagati was opened in November 1862. The extension to Goalundo was opened in January 1871.

The earthwork and the masonry of bridges and viaducts have been constructed for a double line. The rails are double-headed, weighing 74 lbs. per yard, and are laid principally on creosoted pine sleepers.

3. *Oudh and Rohilkhand.*—The Oudh and Rohilkhand Railway runs in a north-westerly direction from Benares, and is approximately parallel to the East Indian Railway at a mean distance of 80 miles, the river Ganges running between the two. It has junctions only with the East Indian Railway, as noted in paragraph 1 above.

The Railway is laid with a single track throughout. There are 80 stations averaging 7 miles apart and 5 engine stations.

Construction was commenced in January 1864. The length of 42 miles from Lucknow in the direction of Cawnpore was opened in April 1867. Two other sections of 30 miles each were opened on the 1st February 1872; and with the exception of the bridge at Cawnpore and the junction with the East Indian Railway at that station, which was completed in July 1875, the line may be said to have been opened throughout in the early part of 1874.

Land has been taken for a double line, but the formation is for a single way. Between Lucknow and Nawabganj, however, the masonry of the bridges has been constructed for a double track. The permanent-way adopted consists of 60-lb. flat-footed rails on cast-iron oval bowl sleepers; but there are short lengths on wrought-iron saddle sleepers and on Bessemer steel saddle sleepers.

4. *Sind, Punjab and Delhi.*—This Railway consists of two distinct and separate sections, *viz.*, the Punjab section, 554 miles in length from Ghaziabad (the junction with the East Indian Railway) to Sher Shah Bandar on the left bank of the Indus and 15 miles beyond Mooltan; and the Sind section, 110 miles long, from Kotri (the junction with the Indus Valley State Railway) to Karachi. On the Punjab section there is a junction at Lahore with the Punjab Northern State Railway, and another at Muzaffarabad, 7 miles to the east of Mooltan, with the Indus Valley State Railway.

The road is laid with a single track on both sections, except 4½ miles of double way in Karachi.

There are 73 stations on the Punjab section, being at an average distance of 7½ miles, and 10 on the Sind section at 12 miles' intervals. There are 6 engine stations on the former and 2 on the latter.

The Sind section was commenced in April 1858, and was opened throughout its length in May 1861.

The length from Amritsar to Mooltan and Sher Shah, 250 miles, was commenced in February 1859, and was opened to Lahore, 32 miles, in April 1862, and from Lahore to Mooltan, 208 miles, in April 1865.

The portion from Ghaziabad to Amritsar, 304 miles, was commenced early in 1864; and in May 1865 Messrs. Brassey and Company entered into a contract for the construction of the line in five years. This period was subsequently extended to six years, owing to the magnitude and large additions made to the original design of the Sutlej bridge. The first length to Meerut city, 27½ miles, was opened in April 1867, and in November of the same year 26 miles were opened from the Beas river to Amritsar. Uninterrupted communication between Mooltan and Delhi *viâ* Ghaziabad was established by the completion of the Sutlej bridge in November 1869.

On the Sind section the earthwork is for a single line, masonry of bridges for a double line, and iron superstructure for one road. The permanent-way consists of double-headed rails, 65 lbs. to the yard, laid on sleepers of creosoted pine and babul.

From Amritsar to Mooltan and Sher Shah the earthwork and bridges are for a single way. Double-headed rails of 68 lbs. per yard have been used throughout, 77½ miles being supported on Greaves' bowls, the remainder on wooden sleepers, which, however, are being renewed with iron.

From Amritsar to Beas the earthwork is for a double road; that of the remaining distance to Ghaziabad is for a single line. The rails used were single-headed of "steel iron," weiging 60 lbs. to the yard: these have, however, failed, and are being replaced by solid steel.

5. *Madras.*—This Railway at Arconum, 42 miles to the west of Madras, bifurcates into two main lines, *viz.*, the North-West line, which meets the Great Indian Peninsula Railway at Raichur, 308 miles,* and has a branch, 31½ miles long, to Bellary; and the South-West line, which runs to Beypore on the west coast, 364 miles,* with branches to Bangalore, 87 miles, and to Mettapalaiyam at the foot of the Nilgiri hills, 26 miles.

* From the junction Arconum.

There are junctions with the South Indian Railway at Arconum and Erode, and with the Mysore State Railway at Bangalore, both these lines being of the metre gauge.

With the exception of a double road from Madras to Arconum, the line is single throughout.

There are 105 stations, giving intervals of $8\frac{1}{4}$ miles, and 10 engine stations.

Work was commenced on the South-West line in June 1853, which, in July 1856, was opened to Arcot, 63 miles, through communication with Beypore being established in May 1862. Junction was effected with the Great Indian Peninsula Railway in March 1871.

Except on the double portion, the embankments are for a single track; but the bridges and viaducts are built for a double way, except on the Nilgiri and Bellary branches. The rails, weighing from 65 to 84 lbs. per yard, are supported on iron pot sleepers, with the exception of a few miles near Beypore of creosoted pine. The South-West line was originallylaid with sleepers of indigenous woods; but these were not found to answer, and have nearly all been replaced by iron.

6. *Great Indian Peninsula.*—This line, starting from Bombay, divides into two at Kalian, on the 33rd mile. The north-east line, 582 miles,* meets the East Indian Railway at Jubbulpore, and has a branch of 245 miles to Nagpur, and a short coal line of 12 miles to Mohpani. The south-east line, 409 miles,* meets the Madras Railway at Raichur, and has a branch of $7\frac{1}{4}$ miles (seldom worked) to Campuli, at the foot of the Ghats. Besides those abovementioned, there are junctions with the Bombay, Baroda and Central India Railway at Dadur, with the Dhond and Manmad State Railway at Dhond and Manmad, with the Wardha Coal Railway at Wardha, the two small Berar lines at Jalamb and Badnera, and with the Nizam's Railway at Wadi—all these lines being on the broad gauge: it also effects a junction at Nagpur with the metre gauge Nagpur and Chhattisgarh State Railway.

There are 325 miles of double road. There are 163 stations at average intervals of nearly 8 miles and 17 engine stations. Construction was commenced in October 1850, and a length of $20\frac{1}{2}$ miles from Bombay to Thana was opened in April 1853. This was the first Railway opened in India.

Excepting the double portion, the earthwork is for a single line, and the bridges and viaducts for a double line of rails. Most of the rails weigh 68 lbs. per yard; on some short lengths, however, rails weighing 84 lbs. to the yard have been laid. Most of the rails are of iron, but are being replaced by steel as renewals become necessary. The sleepers are chiefly of wood, with a portion of iron bowls.

7. *Bombay, Baroda and Central India.*—The Railway runs nearly due north from Bombay, skirting the coast for 200 miles of its length; it has two short branches, *viz.*, from Anand to Pali, 32 miles, and from Viramgam to Kharaghora, $22\frac{1}{2}$ miles. This latter is the property of the State, but is worked as part of the Company's undertaking.

The junction with the Great Indian Peninsula Railway, being only 6 miles from Bombay, is used solely for the exchange of goods traffic. There are junctions with the Bhavnagar-Gondal and the Rajputana State Railways, both metre gauge, at Wadhwan and Sabarmati (near Ahmedabad) respectively. There are also two junctions with the Gaekwar of Baroda's line, of 2 feet 6 inches gauge, at Miyagam and Baroda.

The Railway has a double track for short sections, aggregating 23 miles in length. There are 74 stations at an average distance of 6 miles apart and 8 engine stations.

Work was commenced in May 1856, and the first section from Amreli to Ankleswar, $28\frac{1}{2}$ miles, was opened in February 1860. In January 1861, $43\frac{3}{4}$ miles were opened from Baroda to the south, and before the end of the year communication between Bulsar and Baroda (123 miles) was established. This length was not connected with Bombay until November 1864, when the main line to Ahmedabad may be said to have been completed.

* From Kalian Junction.

Except on the double portions, the earthwork is for a single line, the bridge piers and abutments being generally built for a double road. With the exception of a short length of Adams' rails, the double-headed rail, weighing 68 lbs. per yard, has been used throughout the main line, supported for the most part on wooden sleepers; iron bowls are used in suitable places. The Wadhwan branch is laid with 60-lb. rails on iron bowl sleepers.

8. *Calcutta and South-Eastern.*—This line extends from Calcutta to Port Canning; it was constructed under a guarantee at the time that the Port Canning Company were endeavouring to divert some of the Calcutta shipping business to Canning. In consequence of the Railway having been worked at a loss since its opening (May 1863), the Company surrendered it to Government, under the provisions of their contract, on the 1st April 1868, since which date the net earnings have amounted to nearly one lakh of rupees. The line is laid with a single track throughout. There are 8 stations at an average distance of 4 miles. From Sonapur on this Railway an extension is now under construction connecting Calcutta with Diamond Harbour *viâ* Magra Hat.

9. *Patna-Gya.*—This Railway connects Bankipur on the East Indian Railway with Gya; it has a single track throughout, which for the first 29 miles has been laid on an existing road with few deviations; the remainder has its own alignment. The rails weigh 60 lbs. to the yard, and are supported on iron bowl sleepers.

The first 28 miles were opened in April and the remaining 29 miles in June 1879. At the end of 1880 the interest on capital had been more than recouped by the net earnings. There are 8 stations at an average distance apart of 8 miles. There are proposals for extending this line to Palamow.

10. *Dildarnagar-Ghazipur.*—This line is being worked as a branch of the East Indian Railway.

11. *Dhond-Manmad.*—This is a chord line between the two trunk lines of the Great Indian Peninsula Railway. It was constructed by the State, but is now being worked as part of the latter. There are 18 stations at an average distance apart of $8\frac{1}{2}$ miles.

12. *Wardha Coal.*—This Railway was constructed to carry the coal from the Warora Mines to the Great Indian Peninsula Railway, and its traffic chiefly depends on the output of coal, which, owing to defects in machinery, was much restricted in 1880.

13. *Sindia.*—Until this year, 1881, the traffic on this line has been seriously affected by the want of the bridge over the Chambal. The line now extends from Agra to Gwalior, 75 miles, and is worked as part of the East Indian Railway.

14. *Punjab Northern.*—This Railway extends in a north-westerly direction from Lahore (its junction with the Sind, Punjab and Delhi Railway) to Attock on the Indus, 237 miles. The river Indus is being bridged, and the line is being continued to Peshawar, 45 miles.

There is a branch on the metre gauge from Lala Musa, 82 miles from Lahore, to Miani on the Jhelum, constructed chiefly for the carriage of salt. A branch 67 miles long has also been constructed from Tarnaul, 11 miles west of Rawalpindi, to Khushalgarh on the Indus, in the direction of Kohat. This was opened to Khushalgarh in April 1881.

The line is constructed with a single track throughout.

From Lahore to Pindi, 174 miles, the rails weigh 60 lbs. to the yard, and are carried on cross-sleepers, chiefly of deodar.

Beyond Pindi 62-lb. steel rails have been used. Here the gradients are very heavy, $\frac{1}{50}$ and $\frac{1}{40}$ for considerable lengths, which adds considerably to the cost of working.

The line has been opened in a very incomplete state, in order to accommodate the troop traffic to and from Afghanistan, and is only now being got into working order.

15. *Indus Valley and Kandahar.*—This line unites the two portions of the Sind, Punjab and Delhi Railway. At Ruk near Sukkur a line called the Kandahar

Railway branches off northwards in the direction of Kandahar and runs as far as Sibi, 133 miles, and thence to Nari gorge, 7 miles. From Sibi there is a branch of 19 miles to the mouth of the Bolan pass at Pir Chauki.

The line is laid with a single track throughout. Excluding the branch, there are 49 stations and 7 engine stations.

The Indus at Sukkur is unbridged, and communication is kept up by means of a steam ferry, goods being ferried across without breaking bulk. The rails used weigh 60 lbs. to the yard, and are carried on cross-sleepers, chiefly of creosoted pine and deodar.

16 and 17. *Khamgaon and Amraoti.*—These short lines, situated in Berar, were constructed chiefly to connect the cotton marts of the names they bear with the Great Indian Peninsula Railway. They are now worked as branches of that Railway.

18. *Nizam's.*—This line connects the Great Indian Peninsula Railway with Hyderabad at a point 376 miles from Bombay in the direction of Madras, and is the property of the Nizam. Work was commenced about the middle of 1871, and the line was opened throughout in October 1874. There is a single track only, of which 87 miles are laid with double-headed 68-lb. rails on iron bowl sleepers, and the remainder with 60-lb. flat-footed rails on creosoted pine. There are 12 stations at average intervals of 11 miles and 2 engine stations.

NARROW GAUGE.

1. *South Indian.*—This line, which now has a metre gauge throughout, originally consisted of several portions. The length from Negapatam to Erode, 167 miles, was commenced in May 1859 by the Great Southern of India Railway Company, and was completed on the 5′ 6″ gauge. The portion from Arconum to Little Conjeveram was commenced in March 1864 on the 3 feet 6 inches gauge, and in January 1863 a contract and 3 per cent. guarantee were granted to the Carnatic Railway Company for the extension to Cuddalore. In July 1874 the two undertakings were amalgamated, under the title of the South Indian Railway, and the whole system is now on the metre gauge.

The earthwork and bridges are for a single way, except from Negapatam to Trichinopoly, where the bridges have been built for a double road. On the section between Negapatam, the old rails, weighing 68 lbs. to the yard, are laid on iron and wooden sleepers, but on the greater length of the system the rails are 40·3 lbs. to the yard on wooden sleepers.

There are 99 stations at average intervals of 6½ miles and 10 engine stations.

2. *Nalhati.*—This short line meets the East Indian Railway at a point 145 miles from Calcutta and runs to Azimganj. It was constructed on the 4 feet gauge by the Indian Branch Railway Company, and bought by the State in March 1872. It was opened for traffic in December 1863.

The line was laid on one-half of a metalled road with rails weighing 32 lbs. per yard.

3. *Northern Bengal.*—Omitting the broad gauge portion worked as part of the Eastern Bengal Railway, as noted above, this line extends from the north bank of the Ganges to Siliguri at the foot of the Himalayas, whence there is a steam tramway to Darjeeling.

There is a branch of 34 miles from Parbatipur to Kaunia on the river Teesta.

There are 30 stations on the line, rather less than 8 miles apart, and 6 engine stations.

The line is constructed for a single track, but sufficient land has been taken for a second line of rails.

The first section opened consists of 134 miles between the Atrai river and Jalpaiguri, and the mail line was completed by the opening of the northern section in June 1878. The road is laid with 40-lb. rails on wooden cross-selepers, chiefly creosoted pine, with a proportion of sal and red gum.

4. *Tirhoot.*—With the exception of the short branch from Barrh on the East Indian Railway, this line is located to the north of the Ganges. From Somastipur, 27 miles from Ganges bank, there is a branch to the north-west, which was opened to Muzaffarpur, 32 miles, in February 1877. This is now being extended to Bettiah, another 78 miles. The present mail line continues

from Somastipur to Durbhanga, 23 miles, and is being extended to Pipra Ghat, 28 miles. The Durbhanga line, after having been partially opened for short periods, was finally opened for traffic in November 1875.

The line is single, and is built with 40-lb. rails on wooden cross-sleepers, chiefly deodar.

The stations average a distance of $7\frac{1}{3}$ miles apart.

5. *Muttra-Hathras.*—This line, which connects the left bank of the river Jumna, opposite to the town of Muttra, with the East Indian Railway at a point 857 miles from Calcutta, borders and is partly laid on a metalled road. The rails weigh 30 lbs. to the yard, and are laid on wooden cross-sleepers, chiefly of deodar. An extension of 24 miles from Muttra to Achneyra on the Rajputana Railway is in course of construction. On this length heavier metals will be used.

6. *Cawnpore-Farukhabad.*—This line is now open from Cawnpore on the East Indian Railway to Farukhabad, 86 miles. The first section, as far as Mira Serai, 49 miles, was opened on the 15th December 1880.

7. *Nagpur-Chhattisgarh.*—This line, starting from the Great Indian Peninsula Railway station at Nagpur, passes through the cantonment of Kampti, and takes a westerly direction. It was opened to Tumsar, 53 miles, for goods traffic in April 1880, and for passenger traffic in November. It is in contemplation to extend this line to Bilaspur, 261 miles from Nagpur, with the view of opening out the rich grain-producing districts of Chhattisgarh.

8. *Rangoon and Irrawaddy Valley.*—The location of this line is expressed in its name. It was opened throughout its length from Rangoon to Prome, 161 miles, in May 1877. The stations are a little short of 7 miles apart on an average. An extension of 42 miles to Allanmyo is included in the original proposal.

9. *Rajputana.*—This line connects Delhi with Bombay, its northern termini being at Delhi and Agra, where there are junctions with the East Indian Railway, and its southern terminus being at Sabarmati near Ahmedabad, where it effects a junction with the Bombay, Baroda Railway. The lines from Delhi and Agra meet at Bandikui, 134 miles from the former and 93 from the latter. There is a junction with the Holkar and Sindia-Neemuch Railway at Ajmere, and on the completion of this latter line the two railways will probably be worked as one undertaking. There is a short Salt branch to the Sambhar lake, leaving the main line at 184 miles from Agra. Through communication with Bombay was established on the 1st January 1881.

The line is constructed for a single track, but sufficient land has been taken for a double road. The rails weigh 36 and 40 lbs. per yard, but as renewals become necessary on the main line, the heavier rail is to be everywhere used. The sleepers used are chiefly deodar.

The stations are on the average $8\frac{1}{3}$ miles apart, and there are 10 engine stations.

10. *Holkar and Sindia-Neemuch.*—This Railway, which will shortly be opened throughout, and will then be known as the Malwa Railway, extends from Khandwa on the Great Indian Peninsula Railway to Ajmere, passing through Indore, Neemuch, and Nasirabad, and crossing the Vindhya range. There is a branch, 12 miles long from Fatehabad, 25 miles from Indore, to Ujjain. The total length of the line will be 390 miles.

The stations are at average intervals of $8\frac{1}{3}$ miles.

The construction is similar to that of the Rajputana line, except that the sleepers are chiefly of creosoted pine.

11. *Western Rajputana.*—With the through opening of the Rajputana Railway on the 1st January 1881, this section became merged in the main line, and its existence as a separate railway ceased.

12. *Gaekwar of Baroda's.*—This line is the property of His Highness the Gaekwar of Baroda. The gauge is 2 feet 6 inches. The rails are flat-footed, weighing 30 lbs. to the yard, and are spiked to wooden sleepers. The entire line is on embankment, the formation width being 10 feet. The management and working are in the hands of the Bombay, Baroda and Central India Railway Company. The stations are at intervals of 9 miles on the average.

CHAPTER IX.

STATISTICS.

Statement shewing the general results of working of Indian Railways during the years 1877 to 1880—Statement showing the mileage, average age, cost, and general results of working of all Indian Railways (exclusive of Steam Boat Service figures) up to the year 1880—Abstract of ditto—Return of Rolling Stock on all Indian Railways on 31st December 1880.

Statement showing the general results of working

No.	Railways.	Length of Line Open.						
		1877.	1878.	1879.	1880.	1881.	1877.	1878.
		Miles.	Miles.	Miles.	Miles.	Miles.	Rs.	Rs.
1	East Indian	1,506	1,507	1,507	1,507		1,07,54,853	1,06,54,176
2	Great Indian Peninsula	1,268	1,268	1,272	1,276		58,53,868	61,72,160
3	Sind, Punjab and Delhi	663	663	663	663		25,78,941	30,77,570
4	Madras	858	857	857	858		26,99,426	27,82,517
5	Bombay, Baroda and Central India ...	444	444	444	444		23,96,211	23,67,422
6	Eastern Bengal	171	172	172	172		12,85,016	15,29,356
7	Oudh and Rohilkhand	544	547	547	547		17,28,690	17,18,037
8	Indus Valley	...	501	508	642		...	2,29,084
9	Punjab Northern...	103	103	103	228		3,38,552	3,04,881
10	Dhond and Manmad	...	145	145	145		...	49,641
11	Patna-Gya	...	...	57	57		...	...
12	Nizam's	120	120	120	120		2,97,145	2,62,213
13	South Indian	600	611	625	647		15,96,193	19,06,087
14	Rajputana	396	428	445	484		8,91,288	8,23,173
15	Holkar and Sindia-Neemuch ...	107	172	172	254		2,03,655	3,31,845
16	Nagpur and Chhattisgarh	...	...	...	53		...	...
17	Rangoon and Irrawaddy Valley ...	161	161	161	161		2,80,860	6,73,079
18	Northern Bengal	134	219	225	231		16,008	3,18,304
19	Tirhoot	76	82	82	82		1,53,815	1,92,904
20	Cawnpore and Farukhabad* ...	...	...	...	...		...	...
21	Bhavnagar-Gondal†	...	...	...	...		...	...

* Opened for traffic on
† Opened for traffic on

of Indian Railways during the years 1877 to 1880.

Earnings.								
Coaching.			Goods.					No.
1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1,11,77,844	1,16,73,269		3,13,34,202	2,75,56,929	3,02,19,425	2,98,32,892		1
60,82,221	61,30,903		2,58,16,905	2,11,05,590	1,85,21,797	1,83,14,143		2
38,76,099	43,33,619		50,94,748	46,53,186	63,83,378	67,34,266		3
26,21,195	25,45,839		70,87,341	35,69,536	37,30,522	33,41,731		4
23,20,288	27,00,522		47,86,326	43,48,393	46,17,278	51,81,628		5
14,92,425	14,88,015		29,31,399	26,19,807	25,10,442	28,73,263		6
17,89,287	19,13,161		21,86,177	24,86,714	21,31,663	22,16,668		7
7,93,996	18,03,906		...	3,18,543	22,01,809	40,08,327		8
6,90,372	10,79,731		3,38,479	4,92,804	10,99,774	18,78,514		9
1,43,473	3,20,825		...	80,029	2,46,822	3,39,760		10
1,69,452	3,38,392		...	...	50,009	1,38,952		11
3,00,359	3,08,771		5,31,700	5,27,443	3,81,623	3,79,944		12
20,03,022	20,62,513		15,14,783	12,26,495	13,09,593	14,45,911		13
9,27,916	10,66,881		17,31,470	20,61,368	25,08,999	25,75,546		14
3,97,998	5,79,716		2,60,503	5,68,818	7,08,909	7,83,979		15
...	19,712		...	...	...	83,823		16
6,96,980	7,45,221		61,736	2,79,213	2,44,123	5,58,177		17
4,41,998	5,32,237		13,983	4,42,359	6,75,877	8,07,999		18
2,12,236	2,27,433		96,263	1,58,087	1,48,660	2,03,339		19
...	...		...	...	...	...		20
...	...		...	...	...	...		21

the 15th December 1880.
the 20th December 1880.

Statement showing the general results of working of

No.	Railways.	Steam Boat Service.					
		1877.	1878.	1879.	1880.	1881.	1877.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	East Indian	45,550	41,118	28,801	30,686		22,17,157
2	Great Indian Peninsula	...	...	...	...		11,03,376
3	Sind, Punjab and Delhi	15,09,300	8,48,436	4,48,861	2,43,930		6,63,392
4	Madras	...	...	...	...		2,48,528
5	Bombay, Baroda and Central India ...	...	727	215	...		6,16,375
6	Eastern Bengal	4,71,031	4,28,833	4,38,113	4,84,843		1,39,587
7	Oudh and Rohilkhand	...	...	...	...		4,26,938
8	Indus Valley	...	18,061	81,224	1,89,723		...
9	Punjab Northern	...	...	...	...		19,730
10	Dhond and Manmad	...	...	...	...		...
11	Patna-Gya	...	...	...	...		...
12	Nizam's	...	...	...	...		1,923
13	South Indian	...	...	...	...		1,22,270
14	Rajputana	...	...	...	...		73,929
15	Holkar and Sindia-Neemuch ...	...	...	...	...		15,970
16	Nagpur and Chhattisgarh	...	...	...	...		...
17	Rangoon and Irrawaddy Valley ...	...	...	...	...		1,856
18	Northern Bengal	...	92,059	1,31,949	1,63,505		18,726
19	Tirhoot	15,635	72,159	74,194	98,143		33,844
20	Cawnpore and Farukhabad	...	...	...	...		...
21	Bhavnagar-Gondal	...	...	...	...		...

Indian Railways during the years 1877 to 1880—continued.

Earnings—*continued.*									
Sundries, including Telegraph.				Total.					No.
1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
15,25,786	18,90,151	14,08,269		4,43,51,760	3,97,78,009	4,33,16,221	4,29,45,116		1
10,87,061	6,44,297	5,08,207		3,27,74,149	2,83,64,811	2,52,48,315	2,49,53,253		2
3,51,023	7,06,337	10,49,703		98,46,381	89,30,215	1,14,14,676	1,24,11,518		3
2,78,121	2,74,769	2,74,975		1,00,35,295	66,30,174	66,26,486	61,62,545		4
1,89,135	2,15,007	3,62,225		77,98,912	69,05,677	71,52,788	82,44,375		5
67,825	62,945	90,040		48,27,033	46,45,821	45,03,925	49,36,161		6
4,17,286	4,23,893	3,25,321		43,41,805	46,22,037	43,44,843	44,55,150		7
6,421	2,00,511	6,60,426		...	5,72,109	32,77,540	66,62,382		8
21,886	59,935	4,10,038		6,96,761	9,09,571	18,50,081	33,68,284		9
5,584	77,262	34,509		...	1,35,254	4,67,557	6,95,094		10
...	11,048	4,212		...	...	2,30,509	4,81,556		11
2,097	12,419	14,001		8,30,768	7,91,753	6,94,401	7,02,716		12
1,00,557	49,452	51,170		32,33,246	32,33,139	33,62,067	35,59,594		13
88,060	1,08,504	1,81,292		26,96,687	29,72,601	35,45,420	37,23,719		14
28,382	38,931	37,564		4,80,128	9,29,045	11,45,838	14,01,259		15
...	...	417		...	...	...	1,03,952		16
10,677	14,815	19,312		3,44,452	9,62,969	9,55,918	13,22,710		17
1,26,808	1,34,436	1,09,060		48,717	9,79,530	13,84,260	16,12,801		18
18,158	23,643	22,152		2,99,557	4,41,308	4,58,733	5,51,067		19
...	...	...		...	...	...	...		20
...	...	...		...	...	...	...		21

Statement showing the general results of working of

No.	Railways.	Maintenance per Mile of Track, including Sidings.					Total per total train-mile.				
		1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.
		Rs.	Rs.	Rs.	Rs.	Rs.	As.	As.	As.	As.	As.
1	East Indian	1,584	1,912	1,946	1,974		5·95	6·49	6·63	7·02	
2	Great Indian Peninsula	1,618	1,810	2,264	1,894		11·91	12·28	13·30	12·92	
3	Sind, Punjab and Delhi	1,924	1,859	1,923	1,521		12·20	13·23	12·18	12·38	
4	Madras	1,244	1,272	1,321	1,248		9·52	11·88	11·86	11·48	
5	Bombay, Baroda and Central India ...	1,814	1,426	1,335	1,391		12·46	13·90	13·19	16·23	
6	Eastern Bengal	1,698	1,680	1,830	1,902		9·26	10·61	10·11	9·83	
7	Oudh and Rohilkhand	817	670	829	980		9·06	10·41	9·93	8·79	
8	Indus Valley	...	478	910	1,287		...	12·83	14·50	16·54	
9	Punjab Northern	1,459	2,499	1,602	1,482		12·52	15·46	20·96	17·70	
10	Dhond and Manmad	...	...	637	620		...	16·73	18·61	17·25	
11	Patna-Gya	...	...	423	672		...	...	7·91	10·16	
12	Nizam's	828	1,076	928	559		*	*	15·38	11·03	
13	South Indian	710	1,033	832	854		10·34	11·20	10·06	13·17	
14	Rajputana	1,054	796	962	944		12·61	11·58	11·39	13·44	
15	Holkar and Sindia-Neemuch ...	668	872	907	1,099		10·30	9·48	11·24	11·96	
16	Nagpur and Chhattisgarh	...	...	...	...		...	...	...	14·29	
17	Rangoon and Irrawaddy Valley ...	552	1,595	1,420	1,132		14·94	10·87	11·60	9·75	
18	Northern Bengal	...	524	1,175	738		10·62	9·04	9·57	7·65	
19	Tirhoot	411	639	729	706		8·00	8·67	9·27	8·69	
20	Cawnpore and Farukhabad ...	...	...	...	...		...	...	...	...	
21	Bhavnagar-Gondal	...	...	...	...		...	...	...	...	

* Included with Great

Indian Railways during the years 1877 *to* 1880—continued.

EXPENDITURE.

Locomotive.										Carriage and Wagon.										No.
Cost of fuel per total train-mile.					Repairs per total train-mile.					Per total train-mile.					Repairs of stock per total train-mile.					
1877	1878	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877	1878	1879	1880	1881	
As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	As.	
1·30	1·33	1·67	1·58		1·13	1·42	1·35	1·62		2·32	2·71	2·44	3·08		1·98	2·29	1·89	2·56		1
5·78	5·34	5·51	5·11		1·92	2·38	2·58	2·59		4·58	3·52	4·15	5·12		3·99	2·86	3·30	4·21		2
5·39	6·87	6·77	6·11		1·94	1·91	1·84	2·21		2·88	2·55	2·80	3·15		2·14	1·86	2·14	2·46		3
4·47	4·71	4·25	3·96		2·36	3·36	3·46	3·53		3·09	4·46	2·72	2·64		2·54	3·37	1·83	2·56		4
5·78	6·11	6·74	6·41		2·28	3·02	2·05	2·61		2·95	3·30	3·86	2·62		2·24	2·75	2·08	2·93		5
3·15	3·64	3·36	3·31		1·37	2·01	1·75	1·92		3·48	4·49	4·67	4·84		2·59	3·64	3·63	3·87		6
4·51	4·78	4·47	4·03		1·39	1·87	1·58	1·51		2·24	3·22	3·03	2·99		1·79	2·58	2·24	2·25		7
...	5·02	5·64	8·30		...	1·85	2·94	2·93		...	2·31	2·51	2·26		...	0·71	1·54	1·37		8
5·59	8·27	14·52	10·62		1·22	1·21	0·86	1·21		2·05	2·04	1·83	1·42		1·53	1·48	1·28	0·98		9
...	7·51	10·40	10·03		...	0·86	1·18	2·28		...	0·28	1·02	1·39		...	0·04	0·50	0·74		10
...	...	2·97	4·71		...	...	0·22	0·99		...	...	1·46	2·69		...	...	0·51	1·99		11
*	*	10·18	6·26		*	*	1·07	0·79		*	*	0·71	1·79		*	*	0·37	1·28		12
4·62	4·75	4·15	3·86		1·91	2·62	2·16	2·39		1·80	1·58	4·71	4·40		1·41	1·18	1·54	1·59		13
5·32	4·88	4·84	5·66		1·94	1·71	1·97	2·82		2·60	2·14	1·92	1·56		1·94	1·37	1·27	1·00		14
2·50	3·08	4·70	4·20		1·66	1·12	1·33	2·27		2·28	2·03	4·79	3·36		1·65	1·09	2·89	2·31		15
...	...	...	4·99		...	...	...	0·53		...	...	...	3·72		...	...	...	1·63		16
2·92	2·93	2·57	2·25		2·06	1·69	3·22	2·36		1·43	0·98	1·58	1·69		0·64	0·26	0·64	0·97		17
4·24	2·87	3·78	3·25		0·33	0·61	0·99	0·54		0·47	1·87	1·28	1·11		0·02	0·41	0·53	0·45		18
2·36	2·86	2·78	2·78		0·65	1·35	1·33	1·23		0·79	1·81	2·11	2·21		0·37	1·28	1·56	1·46		19
...	...	...	...		...	...	...	...		...	...	...	...		...	...	...	...		20
...	...	...	...		...	...	...	...		...	...	...	...		...	...	...	...		21

Indian Peninsula Railway.

Statement showing the general results of working of

No.	Railways.	EXPENDI										STEAM-BOAT.		
		Traffic per cent. of Traffic Earnings.					General per cent. of Gross Earnings, excluding Steam-Boat.							
		1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.
												Rs.	Rs.	Rs.
1	East Indian ...	6·63	7·02	6·33	6·24		3·44	3·95	3·54	3·97		87,720	38,924	32,231
2	Great Indian Peninsula	6·90	7·88	8·95	8·32		3·22	3·95	4·35	4·15		...	...	...
3	Sind, Punjab and Delhi	9·31	9·98	9·06	9·58		6·29	6·49	5·16	5·54		10,66,583	8,69,819	7,79,423
4	Madras ...	8·35	13·14	11·24	11·21		4·30	6·85	6·85	7·10		...	...	...
5	Bombay, Baroda and Central India.	8·22	9·05	8·44	7·32		6·41	7·01	6·85	5·87		126	9,001	3,314
6	Eastern Bengal ...	12·08	15·26	11·49	11·58		6·58	7·04	7·46	6·77		2,64,955	2,82,260	2,89,992
7	Oudh and Rohilkhand...	12·11	11·85	13·35	12·93		6·90	7·77	8·69	8·59		...	...	...
8	Indus Valley ...	...	15·40	14·73	10·83		...	18·91	7·21	5·45		...	16,572	90,661
9	Punjab Northern ...	13·66	11·46	10·41	11·59		16·53	12·50	6·07	4·00		...	...	...
10	Dhond and Manmad ...	...	16·43	21·91	12·86		...	24·54	14·59	12·01		...	...	...
11	Patna-Gya ...	...	...	11·26	8·05		...	...	8·61	9·33		...	...	...
12	Nizam's ...	*	*	13·65	12·40		*	*	11·08	11·12		...	...	...
13	South Indian ...	8·86	9·12	9·38	9·71		4·94	7·61	7·38	7·75		...	...	...
14	Rajputana ...	9·11	9·67	9·82	9·61		10·28	9·95	7·75	7·62		...	...	...
15	Holkar and Sindia-Neemuch.	16·50	12·26	12·92	12·33		14·90	12·74	9·16	7·49		...	...	...
16	Nagpur and Chhattisgarh.	...	...	...	21·41		...	...	...	15·30		...	...	...
17	Rangoon and Irrawaddy Valley.	32·60	19·64	14·83	13·39		20·35	13·50	13·48	9·19		...	...	...
18	Northern Bengal ...	56·54	19·61	19·59	12·21		53·20	9·26	20·55	12·97		...	1,07,081	1,07,824
19	Tirhoot ...	17·84	15·28	14·46	12·65		15·72	11·82	14·26	12·27		15,621	81,322	64,399
20	Cawnpore and Farukhabad.	...	...	...	...		...	...	...	...		...	...	...
21	Bhavnagar-Gondal ...	...	...	...	...		...	...	...	...		...	...	...

* Included with Great

Indian Railways during the years 1877 to 1880—continued.

TURE—*continued.*

o		Miscellaneous per cent. of Gross Earnings, excluding Steam-Boat.					Total.					No.
1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	
Rs.	Rs.						Rs.	Rs.	Rs.	Rs.	Rs.	
37,040		3·36	2·04	1·83	1·02		1,41,27,854	1,41,96,819	1,42,35,292	1,41,90,698		1
...		5·69	2·93	3·04	1·98		1,58,28,683	1,38,73,563	1,50,57,714	1,38,47,702		2
5,56,298		1·08	2·33	4·23	4·92		56,57,888	57,60,124	68,74,155	69,40,656		3
...		6·29	2·74	1·62	2·33		59,47,403	50,42,194	45,51,316	42,05,409		4
1,270		0·40	0·87	1·27	0·87		32,73,330	32,18,551	33,59,890	35,09,722		5
3,04,304		1·36	0·76	0·70	1·25		19,82,511	20,30,749	20,70,395	22,11,851		6
...		1·52	1·19	0·99	0·99		22,74,205	25,06,568	25,24,907	25,50,740		7
2,01,586		...	12·56	11·29	11·98		...	7,03,550	26,60,079	47,39,983		8
...		1·43	14·95	23·31	25·83		6,04,879	9,03,761	14,71,192	28,04,113		9
...		...	37·01	13·09	8·73		...	1,77,195	4,95,222	6,06,875		10
...		...	...	12·37	11·16		...	...	1,28,723	2,70,300		11
...		*	*	10·97	6·22		6,44,081	6,79,907	6,04,476	4,78,407		12
...		4·52	4·81	1·79	0·46		16,45,026	21,55,032	22,98,815	26,29,576		13
...		0·10	0·23	0·22	0·16		18,33,367	18,42,130	23,66,253	24,90,414		14
...		0·85	1·03	0·29	0·15		3,69,047	6,27,128	8,54,009	10,47,268		15
...		...	...	...	0·39		...	...	...	82,681		16
...		0·99	1·79	4·41	0·68		4,45,584	8,95,812	8,14,175	8,01,626		17
1,14,906		...	1·18	2·43	1·12		68,347	7,37,724	12,59,140	9,69,292		18
48,596		1·45	1·01	5·54	0·49		2,09,251	3,32,500	3,50,914	3,10,795		19
...		...	...	...	...		...	...	...	...		20
...		...	...	...	...		...	...	...	...		21

Indian Peninsula Railway.

Statement showing the general results of working

No.	Railways.	RESULTS EXCLUSIVE OF STEAM-BOAT												
		Earnings per Traffic Train-Mile.					Expenditure per Traffic Train-Mile.					Net Earnings Train-		
		1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	East Indian	5·00	4·93	5·24	5·61		1·59	1·76	1·72	1·85		3·41	3·17	3·52
2	Great Indian Peninsula ...	4·02	4·40	4·12	4·24		1·94	2·15	2·46	2·35		2·08	2·25	1·66
3	Sind, Punjab and Delhi ...	4·79	4·41	4·31	4·39		2·64	2·67	2·40	2·30		2·15	1·74	1·91
4	Madras	2·82	3·08	3·20	3·29		1·67	2·34	2·20	2·25		1·15	0·74	1·00
5	Bombay, Baroda and Central India	6·46	5·93	5·56	6·97		2·71	2·75	2·59	2·58		3·75	3·18	2·97
6	Eastern Bengal	6·63	6·65	6·07	6·59		2·61	2·76	2·66	2·82		4·02	3·89	3·41
7	Oudh and Rohilkhand ...	3·29	3·39	3·38	3·55		1·73	1·84	1·97	2·03		1·56	1·55	1·41
8	Indus Valley	...	2·33	3·51	3·76		...	2·88	2·82	2·64		...	–0·55	0·69
9	Punjab Northern	2·82	3·64	4·84	3·66		2·45	3·62	3·85	3·05		0·37	0·02	0·99
10	Dhond and Manmad	...	2·34	3·19	3·08		...	3·07	3·38	2·69		...	–0·73	–0·19
11	Patna-Gya	...	...	5·36	4·26		...	...	2·99	2·39		...	...	2·37
12	Nizam's	3·40	2·62	2·96	3·04		2·64	2·25	2·58	2·07		0·76	0·37	0·38
13	South Indian	2·84	2·75	2·90	2·99		1·44	1·83	1·98	2·21		1·40	0·92	0·92
14	Rajputana	3·25	2·99	2·41	2·75		2·21	1·85	1·61	1·84		1·04	1·14	0·80
15	Holkar and Sindia-Neemuch ...	2·79	2·74	2·68	2·74		2·14	1·85	2·00	2·05		0·64	0·89	0·68
16	Nagpur and Chhattisgarh ...	...	...	...	2·66		...	...	...	2·12		...	...	...
17	Rangoon and Irrawaddy Valley...	2·22	3·08	3·16	3·93		2·87	2·86	2·69	2·38		–0·65	0·22	0·47
18	Northern Bengal	1·75	2·84	2·73	2·76		2·45	2·02	2·51	1·63		–0·70	0·82	0·22
19	Tirhoot	3·08	3·00	3·08	3·71		2·15	2·04	2·29	2·15		0·93	0·96	0·79
20	Cawnpore and Farukhabad ...	...	...	...	...		...	...	...	...		...	...	...
21	Bhavnagar-Gondal	...	...	...	...		...	...	...	...		...	...	...

of Indian Railways during the years 1877 to 1880—continued.

SERVICE.							CAPITAL EXPENDED					
PER TRAFFIC MILE.		AVERAGE GROSS ERNINGS PER MILE PER WEEK.					ON OPEN LINE, INCLUSIVE OF ROLLING STOCK.					No.
1880.	1881.	1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
3·76		567	509	554	548		32,42,03,444	32,53,63,079	32,94,21,094	33,03,98,294		1
1·89		497	429	383	377		24,15,85,669	24,63,02,172	24,85,83,445	24,99,77,200		2
2·09		238	230	312	353		10,94,60,302	11,09,81,062	11,37,04,800	11,52,29,919		3
1·04		225	148	149	138		10,87,19,585	10,99,59,654	11,05,95,550	11,08,55,385		4
3·49		338	298	310	357		8,14,97,945	8,14,91,989	8,23,22,437	8,21,07,875		5
3·77		529	473	455	498		3,30,24,862	3,38,11,811	3,42,84,355	3,45,85,309		6
1·52		153	163	153	157		5,33,86,570	5,52,55,100	5,61,92,646	5,81,44,361		7
1·12		...	55	121	221		...	5,13,35,647	5,70,01,762	6,92,82,608		8
0·61		130	170	345	423		1,70,25,460	1,71,07,578	2,45,80,202	4,04,24,501		9
0·39		...	64	76	92		...	71,17,400	95,38,053	1,04,58,463		10
1·87		...	...	122	162		...	...	28,45,078	32,20,951		11
0·97		132	126	111	112		1,15,06,385	1,14,59,384	1,16,10,466	1,20,62,228		12
0·78		107	102	105	107		3,77,65,242	3,93,32,379	4,09,09,354	4,16,72,963		13
0·80		131	137	156	154		2,53,82,403	2,83,21,943	3,09,43,568	3,40,61,947		14
0·69		86	122	129	118		1,14,38,860	1,95,98,318	2,00,13,727	2,53,37,858		15
0·54		...	...	...	51		...	...	...	30,37,689		16
1·55		61	115	114	158		88,45,886	1,12,12,847	1,18,94,894	1,23,07,244		17
1·13		20	87	107	121		1,28,04,745	1,69,11,622	1,90,96,004	2,00,98,652		18
1·56		69	91	90	106		44,91,006	50,09,950	51,33,919	53,46,672		19
...		...	...	...	...		...	...	...	...		20
...		...	...	...	...		...	...	...	...		21

Statement showing the general results of working

No.	Railways.	Net Earnings.				
		1877.	1878.	1879.	1880.	1881.
		Rs.	Rs.	Rs.	Rs.	Rs.
1	East Indian	3,02,23,905	2,55,81,189	2,90,80,929	2,87,54,418	
2	Great Indian Peninsula	1,69,45,466	1,44,91,248	1,01,90,601	1,11,05,551	
3	Sind, Punjab and Delhi	41,88,493	31,70,091	45,40,520	54,70,862	
4	Madras	40,87,892	15,87,980	20,75,170	19,57,136	
5	Bombay, Baroda and Central India ...	45,25,582	36,87,126	37,92,898	47,34,653	
6	Eastern Bengal	28,44,522	26,15,072	24,33,530	27,24,310	
7	Oudh and Rohilkhand	20,67,600	21,15,469	18,19,936	19,04,410	
8	Indus Valley	...	—1,31,441	6,17,459	19,22,399	
9	Punjab Northern	91,882	5,810	3,78,889	5,64,171	
10	Dhond and Manmad	...	—41,941	—27,664	88,219	
11	Patna-Gya	...	...	1,01,787	2,11,256	
12	Nizam's	1,86,687	1,11,846	89,925	2,24,309	
13	South Indian	15,88,220	10,78,107	10,63,252	9,30,018	
14	Rajputana	8,63,320	11,30,471	11,79,167	12,33,305	
15	Holkar and Sindia Neemuch ...	1,11,081	3,01,917	2,91,828	3,53,991	
16	Nagpur and Chhattisgarh	...	...	...	21,271	
17	Rangoon and Irrawaddy Valley ...	—1,01,132	67,157	1,41,743	5,21,084	
18	Northern Bengal	—19,630	2,41,806	1,25,120	6,43,509	
19	Tirhoot	90,306	1,08,808	1,07,818	2,40,272	
20	Cawnpore and Farukhabad ...	...	...	...	...	
21	Bhavnagar-Gondal	...	...	...	...	

of Indian Railways during the years 1877 to 1880—concluded.

Percentage of Expenses to Earnings.					Per cent. of Profits per annum on Capital Expenditure.					No.
1877.	1878.	1879.	1880.	1881.	1877.	1878.	1879.	1880.	1881.	
31·85	35·69	32·86	33·04		9·32	7·86	8·83	8·70		1
48·30	48·91	59·64	55·49		7·01	5·88	4·10	4·44		2
57·46	64·50	60·22	55·92		3·82	2·86	3·99	4·75		3
59·26	76·05	68·68	68·24		3·76	1·44	1·88	1·77		4
41·97	46·61	46·97	42·57		5·55	4·52	4·61	5·77		5
41·07	43·71	45·97	44·81		8·61	7·73	7·10	7·88		6
52·38	54·23	58·11	57·25		3·86	3·83	3·24	3·28		7
...	122·97	81·16	71·15		...	—0·26	1·08	2·77		8
86·81	99·36	79·52	83·25		0·54	0·03	1·54	1·40		9
...	131·01	105·92	87·31		...	—0·58	—0·29	0·84		10
...	...	55·84	56·13		...	...	3·58	6·56		11
77·53	85·87	87·01	68·08		1·62	0·98	0·77	1·86		12
50·88	66·65	68·38	73·87		4·21	2·74	2·60	2·23		13
67·99	61·97	66·74	66·88		3·40	3·99	3·81	3·62		14
76·86	67·50	74·53	74·74		0·97	1·54	1·46	1·40		15
...	...	...	79·54		...	...	...	0·70		16
129·36	93·03	85·17	60·60		—1·14	0·60	1·19	4·23		17
140·29	75·31	90·96	60·10		—0·15	1·43	0·66	3·20		18
69·85	75·34	76·49	56·40		2·01	2·17	2·10	4·49		19
...	...	...	...		...	...	...	...		20
...	...	...	...		...	...	...	...		21

Statement showing the mileage, average age, cost, and general results of working of all Indian Railways up to the year 1880.

[*N.B.*—The figures in this statement have been taken from the half-yearly Revenue Accounts. The figures relating to the Steam Boat Service have been omitted.]

Year.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
									Gross earnings.	Working expenses.	Net profits.		
				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
EAST INDIAN RAILWAY.													
1854 ...	37·75	13·70	0·36	.....	...	93,280	58,005	35,275	...	...	...	131	
1855 ...	120·50	113·02	1·05	.....	...	6,36,210	3,30,548	3,05,662	...	...	...	108	
1856 ...	120·50	120·50	2·05	.....	...	10,48,369	4,25,896	6,22,473	...	...	...	167	
1857 ...	120·50	120·50	3·05	.....	...	14,59,306	5,56,354	9,02,952	...	...	...	232	
1858 ...	139·50	125·19	3·53	.....	...	18,23,919	8,48,021	9,75,898	...	...	...	279	
1859 ...	286·50	249·33	2·59	.....	...	32,88,702	14,72,197	18,16,505	...	...	...	253	
1860 ...	370·25	304·40	2·83	.....	...	36,65,092	17,72,274	18,92,818	...	...	...	231	
1861 ...	560·75	430·10	2·63	.....	...	53,83,060	25,02,719	28,80,341	...	...	...	240	
1862 ...	877·50	638·49	2·41	.....	...	63,86,874	34,36,702	29,50,172	...	...	...	192	
1863 ...	933·00	923·97	3·26	.....	...	1,08,44,651	59,65,320	48,79,231	...	...	...	222	
1864 ...	1,104·00	1,057·13	3·71	.....	...	1,39,31,130	70,75,628	68,55,502	...	...	...	253	
1865 ...	1,127·50	1,125·64	4·63	.....	...	1,82,50,754	81,79,114	1,00,71,640	...	...	...	311	
1866 ...	1,127·50	1,127·50	5·63	.....	...	2,19,89,012	97,28,447	1,22,60,565	...	...	...	374	
1867 ...	1,353·00	1,223·04	5·60	.....	...	2,35,33,695	1,15,09,210	1,20,24,485	...	...	...	369	
1868 ...	1,353·00	1,353·00	6·60	.....	...	2,43,83,184	1,09,43,821	1,34,39,363	...	...	...	346	
1869 ...	1,353·00	1,353·00	7·60	.....	...	2,81,41,532	1,25,00,880	1,56,40,652	...	...	...	399	
1870 ...	1,353·00	1,353·00	8·60	.....	...	2,99,06,157	1,30,63,749	1,68,42,408	...	...	...	424	
1871 ...	1,503·25	1,503·25	8·74	.....	...	2,65,15,841	1,14,96,674	1,50,19,167	...	...	...	338	
1872 ...	1,503·25	1,503·25	9·74	.....	...	2,88,53,069	1,19,56,058	1,68,97,011	...	...	...	368	
1873 ...	1,503·25	1,503·25	10·74	32,17,25,967	2,14,021	2,99,35,196	1,16,00,980	1,83,34,216	9·31	3·61	5·70	382	
1874 ...	1,503·25	1,503·25	11·74	32,22,38,040	2,14,361	3,71,69,144	1,32,67,702	2,39,01,442	11·53	4·12	7·41	474	
1875 ...	1,503·25	1,503·25	12·74	32,27,95,353	2,14,732	2,93,07,977	1,16,00,138	1,77,07,839	9·08	3·59	5·49	374	
1876 ...	1,503·25	1,503·25	13·74	32,31,23,313	2,14,950	3,54,43,718	1,24,34,645	2,30,09,073	10·97	3·85	7·12	452	
1877 ...	1,503·25	1,503·25	14·74	32,42,03,444	2,15,668	4,43,06,210	1,40,40,134	3,02,66,076	13·67	4·33	9·34	565	
1878 ...	1,503·25	1,503·25	15·74	32,53,63,088	2,16,440	3,97,36,891	1,41,57,895	2,55,78,996	12·21	4·35	7·86	507	
1879 ...	1,504·25	1,504·05	16·73	32,94,21,094	2,18,993	4,32,87,420	1,42,03,061	2,90,84,359	13·14	4·31	8·83	552	
1880 ...	1,504·25	1,504·25	17·73	33,03,98,294	2,19,643	4,29,14,430	1,41,53,658	2,87,60,772	12·99	4·28	8·71	549	

EASTERN BENGAL RAILWAY.

1862	...	107·25	19·76	0·18	.....	...	96,656	53,731	42,925	...	...	...	94
1863	...	107·25	107·25	1·18	.....	...	8,32,921	4,03,380	4,29,541	...	...	...	149
1864	...	111·25	110·75	2·13	.....	...	10,15,049*	5,44,741	4,70,308	...	...	...	176
1865	...	111·25	111·25	3·13	.....	...	13,51,424	6,61,987	6,89,437	...	...	...	233
1866	...	111·25	111·25	4·13	.....	...	14,15,941	7,22,863	6,93,078	...	...	...	243
1867	...	111·25	111·25	5·13	.....	...	16,19,833	7,88,971	8,30,862	...	...	...	279
1868	...	111·25	111·25	6·13	.....	...	17,87,154	8,28,037	9,59,117	...	...	...	308
1869	...	111·25	111·25	7·13	.....	...	18,14,151	9,12,291	9,01,860	...	...	...	313
1870	...	111·25	111·25	8·13	.....	...	19,42,823	10,82,049	8,60,774	...	...	...	335
1871	...	156·25	156·25	6·79	.....	...	21,98,314	12,31,267	9,67,047	...	...	...	270
1872	...	156·25	156·25	7·79	.....	...	28,02,173	18,65,279	9,36,894	...	...	...	344
1873	...	158·00	156·87	8·70	3,05,37,109	1,93,273	30,84,504	15,13,798	15,70,706	10·10	4·96	5·14	377
1874	...	158·00	158·00	9·70	3,16,15,099	2,00,096	35,64,841	18,60,141	17,04,700	11·27	5·88	5·39	433
1875	...	158·00	158·00	10·70	3,18,80,302	2,01,774	29,34,327	18,23,909	11,10,418	9·20	5·72	3·48	356
1876	...	158·00	158·00	11·70	3,20,75,662	2,03,011	33,01,377	14,41,286	18,60,091	10·29	4·49	5·80	401
1877	...	158·00	158·00	12·70	3,21,03,753	2,03,188	43,56,002	17,17,556	26,38,446	13·56	5·35	8·21	529
1878	...	158·00	158·00	13·70	3,25,89,022	2,06,260	42,16,988	17,48,489	24,68,499	12·94	5·36	7·58	512
1879	...	158·00	158·00	14·70	3,30,17,629	2,08,972	40,65,812	17,80,403	22,85,409	12·31	5·39	6·92	494
1880	...	158·00	158·00	15·70	3,31,68,524	2,08,935	44,51,318	19,07,547	25,43,771	13·42	5·75	7·67	540

* Excluding the length from Kooshtea engine-shed to old Kooshtea (¾ mile).

OUDH AND ROHILKHAND RAILWAY.

1867	...	42·00	29·11	0·69	.....	...	1,12,166	1,19,986	**—7,820**	...	...	...	74
1868	...	42·00	42·00	1·69	.....	...	2,62,647	1,69,521	93,126	...	...	...	120
1869	...	42·00	42·00	2·69	.....	...	2,12,925	1,74,041	38,884	...	...	...	97
1870	...	42·00	42·00	3·69	.....	...	2,45,793	5,60,232	**—3,14,439**	...	...	...	112
1871	...	42·00	42·00	4·69	.....	...	2,56,144	1,77,541	78,603	...	...	...	117
1872	...	293·50	144·17	1·16	.....	...	4,22,760	2,89,922	1,32,838	...	...	...	56
1873	...	456·50	387·51	1·59	3,02,03,680	66,164	11,23,900	8,19,458	3,04,442	3·72	2·71	1·01	56
1874	...	540·50	533·00	2·33	4,64,67,380	85,971	20,04,020	12,90,826	7,13,194	4·31	2·78	1·53	72
1875	...	543·75	542·01	3·31	5,07,05,050	93,251	27,51,244	16,42,745	11,08,499	5·42	3·24	2·18	97
1876	...	543·75	543·75	4·31	5,29,66,230	97,409	34,11,422	21,81,020	12,30,402	6·44	4·12	2·32	120
1877	...	543·75	543·75	5·31	5,42,39,610	99,751	43,41,805	22,74,205	20,67,600	8·00	4·19	3·81	153
1878	...	546·75	544·25	6·28	5,50,82,280	1,00,745	46,22,037	25,06,568	21,15,469	8·39	4·55	3·84	163
1879	...	546·75	546·75	7·28	5,59,73,380	1,02,375	43,44,843	25,24,907	18,19,936	7·76	4·51	3·25	153
1880	...	546·75	546·75	8·28	5,77,96,380	1,05,709	44,55,150	25,50,740	19,04,410	7·71	4·41	3·30	157

Statement showing the mileage, average age, cost, &c., of all Indian Railways—continued.

Year.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
									Gross earnings.	Working expenses.	Net profits.		
				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
SIND, PUNJAB AND DELHI RAILWAY.													
1861 ...	109·75	70·06	0·64	.....	...	2,11,207	2,05,460	5,747	...	...	...	58	
1862 ...	141·75	133·07	1·43	.....	...	7,76,082	6,07,683	1,68,399	...	...	...	112	
1863 ...	141·75	141·75	2·43	.....	...	12,56,851	10,43,747	2,13,104	...	...	...	171	
1864 ...	141·75	141·75	3·43	.....	...	12,51,843	10,92,345	1,59,498	...	...	...	170	
1865 ...	349·75	285·36	2·21	.....	...	14,93,936	12,27,676	2,66,260	...	...	...	101	
1866 ...	349·75	349·75	3·21	.....	...	21,21,223	16,79,002	4,42,221	...	...	...	116	
1867 ...	403·25	373·53	3·71	.....	...	23,53,895	21,07,930	2,45,965	...	...	...	121	
1868 ...	403·25	403·25	4·71	.....	...	23,59,764	22,58,168	1,01,596	...	...	...	112	
1869 ...	621·25	543·35	3·93	.....	...	33,04,109	26,66,257	6,37,852	...	...	...	117	
1870 ...	663·50	644·74	4·65	.....	...	46,78,353	35,63,101	11,05,252	...	...	...	140	
1871 ...	663·50	663·50	5·65	.....	...	42,25,118	41,86,072	39,046	...	...	...	122	
1872 ...	663·50	663·50	6·65	.....	...	46,41,549	39,80,906	6,60,643	...	...	...	134	
1873 ...	663·50	663·50	7·65	9,04,02,458	1,36,251	53,16,035	36,50,505	16,65,530	5·88	4·04	1·84	154	
1874 ...	663·50	663·50	8·65	8,44,36,811	1,27,260	66,02,995	36,54,750	29,48,245	7·82	4·33	3·49	191	
1875 ...	663·50	663·50	9·65	10,36,23,458	1,56,177	55,84,762	35,78,912	20,05,850	5·39	3·45	1·94	161	
1876 ...	663·50	663·50	10·65	10,41,58,735	1,56,984	64,37,104	43,15,083	21,22,021	6·18	4·14	2·04	186	
1877 ...	663·50	663·50	11·65	10,46,37,469	1,57,705	83,37,081	45,91,305	37,45,776	7·97	4·39	3·58	241	
1878 ...	663·50	663·50	12·65	10,61,58,240	1,59,997	80,81,779	48,90,305	31,91,474	7·61	4·61	3·00	234	
1879 ...	663·50	663·50	13·65	10,89,27,371	1,64,171	1,09,65,815	60,94,732	48,71,083	10·07	5·60	4·47	317	
1880 ...	663·50	663·50	14·65	11,04,52,484	1,66,470	1,21,67,588	63,84,358	57,83,230	11·02	5·78	5·24	352	
MADRAS RAILWAY.													
1856 ...	65·00	32·77	0·50	.....	...	1,27,863	66,058	61,805	...	...	...	75	
1857 ...	80·50	75·15	1·34	.....	...	3,58,102	1,68,762	1,89,340	...	...	...	91	
1858 ...	95·50	89·83	2·07	.....	...	4,33,762	2,40,889	1,92,873	...	...	...	93	
1859 ...	95·50	95·50	3·07	.....	...	6,06,769	3,66,155	2,40,614	...	...	...	122	
1860 ...	136·50	129·51	3·10	.....	...	7,91,500	5,81,760	2,09,740	...	...	...	117	
1861 ...	296·50	241·89	2·24	.....	...	11,45,172	8,13,998	3,31,174	...	...	...	91	
1862 ...	446·75	392·79	2·37	.....	...	17,16,671	12,70,751	4,45,920	...	...	...	84	

1863	...	446·75	446·75	3·37	.....	...	25,53,504	17,50,964	8,02,540	...	...	...	110
1864	...	569·50	491·81	3·51	.....	...	34,09,057	16,91,491	17,17,566	...	...	...	133
1865	...	609·00	582·70	4·24	.....	...	44,18,249	20,18,527	23,99,722	...	...	...	145
1866	...	643·25	623·36	4·96	.....	...	47,80,942	21,81,509	25,99,433	...	...	...	147
1867	...	643·25	643·25	5·96	.....	...	51,38,099	22,23,125	29,14,974	...	...	...	153
1868	...	675·75	654·11	6·64	.....	...	61,76,100	25,62,820	36,13,280	...	...	...	181
1869	...	705·50	688·22	7·32	.....	...	61,37,801	30,17,661	31,20,140	...	...	...	171
1870	...	781·50	709·66	7·52	.....	...	53,80,501	28,33,023	25,47,478	...	...	...	146
1871	...	830·00	823·62	8·07	.....	...	59,90,455	30,71,093	29,19,362	...	...	...	139
1872	...	830·00	830·00	9·07	.....	...	62,05,653	32,38,962	29,66,691	...	...	...	143
1873	...	858·00	842·49	9·76	10,52,09,935	1,22,622	68,83,350	39,19,378	29,63,972	6·54	3·72	2·82	157
1874	...	858·00	858·00	10·76	10,59,29,106	1,23,046	59,06,500	38,19,533	20,86,967	5·57	3·60	1·97	132
1875	...	858·00	858·00	11·76	10,63,19,302	1,23,915	64,29,752	45,18,602	19,11,150	6·05	4·25	1·80	144
1876	...	858·00	858·00	12·76	10,66,82,346	1,24,338	71,13,773	45,79,778	25,33,995	6·67	4·29	2·38	159
1877	...	858·00	858·00	13·76	10,87,19,585	1,26,713	1,00,35,295	59,47,403	40,87,892	9·23	5·47	3·76	225
1878	...	858·00	858·00	14·76	10,99,59,654	1,28,158	66,30,174	50,42,194	15,87,980	6·03	4·59	1·44	148
1879	...	858·00	858·00	15·76	11,05,95,550	1,28,899	66,26,486	45,51,316	20,75,170	5·99	4·11	1·88	148
1880	...	858·00	858·00	16·76	11,08,55,385	1,29,202	61,62,545	42,05,409	19,57,136	5·56	3·79	1·77	138

SOUTH INDIAN RAILWAY.

1861	...	48·25	9·53	0·20	.....	...	37,871	17,969	19,902	...	...	...	77
1862	...	81·75	75·42	1·04	.....	...	2,38,607	1,06,033	1,33,574	...	...	...	61
1863	...	81·75	81·75	2·04	.....	...	3,13,899	1,40,001	1,73,898	...	...	...	74
1864	...	81·75	81·75	3·04	.....	...	2,95,279	1,69,929	1,25,350	...	...	...	69
1865	...	99·25	93·16	3·45	.....	...	3,84,396	1,90,381	1,94,015	...	...	...	79
1866	...	143·75	102·79	3·10	.....	...	5,71,677	2,81,709	2,89,968	...	...	...	106
1867	...	160·50	152·19	3·72	.....	...	6,85,132	3,40,264	3,44,868	...	...	...	86
1868	...	184·00	182·00	4·24	.....	...	8,46,331	4,11,646	4,34,685	...	...	...	90
1869	...	184·00	184·00	5·24	.....	...	8,13,028	5,23,940	2,89,088	...	...	...	84
1870	...	184·00	184·00	6·24	.....	...	8,09,549	5,05,148	3,04,401	...	...	...	84
1871	...	184·00	184·00	7·24	.....	...	8,13,882	4,52,563	3,61,319	...	...	...	84
1872	...	184·00	184·00	8·24	.....	...	8,42,022	4,78,872	3,63,150	...	...	..	87
1873	...	184·00	184·00	9·24	1,53,11,600	82,426	11,53,212	5,76,462	5,76,750	7·53	3·76	3·77	120
1874	...	184·00	184·00	10·24	1,53,21,663	82,182	9,69,746	5,89,679	3,80,067	6·33	3·85	2·48	101
1875	...	280·00	216·09	7·36	2,06,06,170	73,593	10,78,481	5,19,400	5,59,081	5·23	2·52	2·71	96
1876	...	472·75	422·15	5·25	3,13,68,386	68,468	19,90,800	10,60,522	9,30,278	6·35	3·35	3·00	90
1877	...	598·00	577·98	5·12	3,71,85,036	62,182	32,33,246	16,45,026	15,88,220	8·69	4·42	4·27	107
1878	...	610·75	605·70	6·00	3,87,44,014	63,437	32,33,139	21,55,032	10,78,107	8·34	5·56	2·78	102
1879	...	631·50	613·73	6·77	4,09,01,593	64,769	33,62,067	22,98,815	10,63,252	8·22	5·62	2·60	105
1880	...	645·25	637·26	7·61	4,16,72,963	64,584	35,59,594	26,29,576	9,30,018	8·54	6·31	2·23	106

Statement showing the mileage, average age, cost, &c., of all Indian Railways—continued.

Year.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
									Gross earnings.	Working expenses.	Net profits.		
				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
GREAT INDIAN PENINSULA RAILWAY.													
1853 ...	20·50	14·49	0·71	.....	...	89,634	41,144	48,490	...	...	...	119	
1854 ...	33·25	29·06	1·31	.....	...	1,38,220	84,045	54,175	...	...	...	88	
1855 ...	49·50	37·35	1·63	.....	...	1,76,560	1,23,971	52,589	...	...	...	89	
1856 ...	87·25	73·70	1·77	.....	...	4,33,602	1,82,862	2,50,740	...	...	...	113	
1857 ...	87·25	87·25	2·77	.....	...	7,25,215	3,28,272	3,96,943	...	...	...	158	
1858 ...	193·50	113·37	1·83	.....	...	11,24,249	4,74,278	6,49,971	...	...	...	173	
1859 ...	244·25	203·23	2·28	.....	...	18,28,528	9,35,971	8,92,557	...	...	...	172	
1860 ...	297·00	286·29	2·84	.....	...	21,43,571	13,06,892	8,36,679	...	...	...	144	
1861 ...	437·75	370·16	2·78	.....	...	26,78,873	20,45,332	6,33,541	...	...	...	139	
1862 ...	495·00	451·40	3·37	.....	...	34,95,590	21,68,018	13,27,572	...	...	...	149	
1863 ...	555·00	532·37	3·96	.....	...	48,24,152	32,58,899	15,65,253	...	...	...	175	
1864 ...	587·50	561·14	4·70	.....	...	69,61,996	50,17,777	19,44,219	...	...	...	119	
1865 ...	703·75	603·72	4·76	.....	...	1,29,56,625	77,14,871	52,41,754	...	...	...	414	
1866 ...	*817·75	735·16	5·12	.....	...	1,36,97,154	79,53,801	57,43,353	...	...	...	357	* Excludes Mohpani Branch.
1867 ...	854·50	843·21	5·86	.....	...	1,62,18,683	90,32,796	71,85,887	...	...	...	368	
1868 ...	875·50	872·79	6·72	.....	...	1,61,45,882	99,79,215	61,66,667	...	...	...	357	
1869 ...	875·50	875·50	7·72	.....	...	1,58,01,210	1,05,53,746	52,47,464	...	...	...	348	
1870 ...	1,260·50	1,162·74	6·28	.....	...	1,81,28,937	1,12,85,474	68,43,463	...	...	...	300	
1871 ...	1,275·75	1,270·74	7·20	.....	...	2,02,47,045	1,27,62,671	74,84,374	...	...	...	307	
1872 ...	1,275·75	† 1,275·75	8·20	.....	...	1,87,28,265	1,20,32,009	66,96,256	...	...	...	284	† Excluding Mohpani Branch.
1873 ...	1,275·75	1,275·75	9·20	23,62,39,190	1,85,176	1,88,51,120	1,20,81,127	67,69,993	7·98	5·11	2·87	284	
1874 ...	1,275·75	1,275·75	10·20	23,67,57,570	1,85,583	2,01,65,973	1,19,32,583	82,33,390	8·54	5·04	3·48	303	
1875 ...	1,275·75	1,275·75	11·20	23,80,65,870	1,86,608	2,15,24,577	1,01,75,853	1,13,48,718	9·04	4·27	4·77	324	
1876 ...	1,275·75	1,275·75	12·20	23,97,99,600	1,87,967	2,45,35,413	1,16,77,891	1,28,57,522	10·23	4·87	5·36	369	
1877 ...	1,275·75	1,275·75	13·20	24,15,85,669	1,89,367	3,27,74,151	1,58,28,683	1,69,45,468	13·57	6·56	7·01	492	
1878 ...	1,275·75	1,275·75	14·20	24,63,02,172	1,93,064	2,83,64,811	1,38,73,563	1,44,91,248	11·51	5·63	5·88	429	
1879 ...	1,275·75	1,275·75	15·20	24,85,83,445	1,94,853	2,52,48,315	1,50,57,714	1,01,90,601	10·16	6·06	4·10	383	
1880 ...	1,275·75	1,275·75	16·20	24,99,77,200	1,95,945	2,49,53,253	1,38,47,702	1,11,05,551	9·98	5·54	4·44	372	
BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.													
1860 ...	35·00	26·00	0·74	.....	...	66,349	46,559	19,790	...	...	...	49	
1861 ...	134·00	66·51	10·98	.....	...	4,06,854	2,23,639	1,83,215	...	...	...	73	

1862	...	167·25	144·93	1·65	.....	...	7,06,723	3,54,370	3,52,353	...	...	...	94
1863	...	185·00	184·03	2·40	.....	...	13,73,292	6,79,869	6,93,423	...	...	...	138
1864	...	305·75	196·25	2·05	.....	...	15,95,503	13,61,402	2,34,101	...	...	...	156
1865	...	305·75	305·75	3·05	.....	...	35,62,142	22,73,827	12,88,314	...	...	...	223
1866	...	305·75	305·75	4·06	.....	...	44,47,505	31,98,915	12,48,590	...	...	...	278
1867	...	305·75	305·75	5·06	.....	...	46,36,910	30,86,175	15,50,735	...	...	...	291
1868	...	306·75	305·75	6·04	.....	...	45,78,698	33,72,675	12,06,023	...	...	...	287
1869	...	307·50	307·15	7·02	.....	...	49,20,186	36,56,821	12,63,365	...	...	...	307
1870	...	312·50	312·41	7·91	...	...	53,79,250	32,56,664	21,22,586	..	...	...	327
1871	...	349·75	323·31	8·00	...	...	54,74,096	32,67,071	22,07,025	...	...	...	300
1872	...	389·25	373·67	8·15	...	...	56,49,316	33,87,867	22,61,449	...	...	...	290
1873	...	‡411·75	403·67	8·69	7,90,85,433	1,92,071	55,89,798	33,10,942	22,78,856	7·07	4·19	2·88	260
1874	...	428·50	424·05	9·34	8,10,04,047	1,89,041	58,58,414	30,53,218	28,05,196	7·23	3·77	3·46	265
1875	...	430·25	430·23	10·30	8,13,99,633	1,89,191	63,86,783	34,75,021	29,11,762	7·84	4·27	3·57	285
1876	...	439·25	430·89	11·07	8,14,56,207	1,85,467	67,72,292	37,07,006	30,65,286	8·31	4·55	3·76	296
1877	...	444·00	443·63	11·94	8,22,35,127	1,85,214	77,98,912	32,73,204	45,25,708	9·48	3·98	5·50	345
1878	...	444·00	444·00	12·94	8,22,31,760	1,85,207	69,04,950	32,09,550	36,95,400	8·40	3·91	4·49	298
1879	...	444·00	444·00	13·94	8,30,57,040	1,87,065	71,52,573	33,56,576	37,95,997	8·61	4·04	4·57	309
1880	...	444·00	444·00	14·94	8,28,42,480	1,86,582	82,44,375	35,08,452	47,35,923	9·95	4·23	5·72	355

‡Includes Patri Branch.

CALCUTTA AND SOUTH-EASTERN RAILWAY.

1862	...	15·00	14·96	1·00	.....	...	27,780	35,668	—7,888	...	...	...	36
1863	...	28·00	23·23	1·36	.....	...	47,328	62,032	—14,704	...	...	...	38
1864	...	28·00	28·00	2·36	.....	...	77,332	1,05,971	—28,639	...	...	...	53
1865	...	28·00	28·00	3·36	.....	...	1,08,952	1,24,552	—15,600	...	...	...	75
1866	...	28·00	28·00	4·36	.....	...	1,15,293	1,36,731	—21,438	...	...	...	79
1867	...	28·00	28·00	5·36	.....	...	92,920	1,24,198	—31,278	...	...	...	64
1868	...	28·00	28·00	6·36	.....	...	87,878	1,52,131	—64,253	...	...	...	60
1869	...	28·00	28·00	7·36	.....	...	80,786	1,17,579	—36,793	...	...	...	55
1870	...	28·00	28·00	8·36	.....	...	98,844	1,03,670	—4,826	...	...	...	55
1871	...	28·00	28·00	9·36	.....	...	79,308	72,027	7,281	...	...	...	40
1872	...	28·00	28·00	10·36	.....	...	58,711	54,057	4,654	...	...	...	40
1873	...	28·00	28·00	11·36	73,21,970	2,61,499	1,02,072	1,04,687	—2,615	1·39	1·43	—0·04	70
1874	...	28·00	28·00	12·36	73,08,800	2,61,499	99,489	77,945	21,544	1·36	1·07	0·29	68
1875	...	28·00	28·00	13·36	69,07,090	2,46,682	1,03,660	83,429	20,231	1·50	1·21	0·29	71
1876	...	28·00	28·00	14·36	69,01,150	2,46,470	98,343	1,06,824	—8,481	1·43	1·55	—0·12	68
1877	...	28·00	28·00	15·36	69,01,160	2,46,470	1,18,487	96,847	21,640	1·72	1·40	0·31	79
1878	...	28·00	28·00	16·36	69,01,160	2,46,470	1,25,694	94,372	31,322	1·82	1·37	0·45	83
1879	...	28·00	28·00	17·36	66,39,840	2,37,137	1,34,087	89,088	44,999	2·02	1·34	0·68	92
1880	...	28·00	28·00	18·36	66,39,843	2,37,137	1,42,098	1,01,344	40,754	2·14	1·53	0·61	98

Statement showing the mileage, average age, cost, &c., of all Indian Railways—continued.

Year.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
									Gross earnings.	Working expenses.	Net profits.		
				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
NALHATI RAILWAY.													
1864 ...	27·25	27·25	1·03	.....	...	*52,086	*25,460	*26,626	...	...	...	...	* From 21st December 1863 to 31st December 1864.
1865 ...	27·25	27·25	2·03	.....	...	57,507	36,392	21,115	...	...	...	36	
1866 ...	27·25	27·25	3·03	.....	...	52,102	54,787	—2,685	...	...	...	41	
1867 ...	27·25	27·25	4·03	.....	...	63,118	43,432	19,686	...	...	...	36	
1868 ...	27·25	27·25	5·03	.....	...	81,365	68,024	13,341	...	...	...	45	
1869 ...	27·25	27·25	6·03	.....	...	84,595	50,454	34,141	...	...	...	57	
1870 ...	27·25	27·25	7·03	.....	...	86,271	42,077	44,194	...	...	...	60	
1871 ...	27·25	27·25	8·03	.....	...	77,875	45,219	32,656	...	...	...	60	
1872 ...	27·25	27·25	9·03	.....	...	56,447	32,252	24,195	...	...	...	55	
1873 ...	27·25	27·25	10·03	3,00,000	11,009	84,453	50,724	33,729	28·15	16·91	11·24	53	
1874 ...	27·25	27·25	11·03	2,73,170	10,024	85,122	57,220	27,902	31·16	20·95	10·21	60	
1875 ...	27·25	27·25	12·03	2,71,690	9,970	80,098	61,144	18,954	29·48	22·50	6·98	61	
1876 ...	27·25	27·25	13·03	2,71,690	9,970	75,199	83,585	—8,386	27·68	30·76	—3·08	57	
1877 ...	27·25	27·25	14·03	2,71,690	9,970	89,454	89,875	—421	32·92	33·08	—0·16	54	
1878 ...	27·25	27·25	15·03	2,87,610	10,554	90,261	71,677	18,584	31·38	24·92	6·46	64	
1879 ...	27·25	27·25	16·03	3,17,030	11,634	91,779	62,009	29,770	28·95	19·56	9·39	65	
1880 ...	27·25	27·25	17·03	3,25,210	11,934	69,925	73,653	—3,728	21·50	22·65	—1·15	49	
NORTHERN BENGAL RAILWAY.													
1877 ...	134·25	46·34	0·34	1,28,04,740	95,558	48,717	68,347	—19,630	0·38	0·53	—0·15	20	
1878 ...	232·50	210·12	1·10	1,68,95,580	77,149	8,87,471	6,30,642	2,56,829	5·25	3·73	1·52	81	
1879 ...	243·50	238·94	2·03	1,76,12,060	76,243	12,52,311	11,51,317	1,00,994	7·11	6·54	0·53	101	
1880 ...	243·50	243·50	3·03	1,96,73,726	80,796	14,49,296	8,54,386	5,94,910	7·36	4·34	3·02	114	
TIRHOOT RAILWAY.													
1875 ...	43·00	7·19	0·16	16,64,126	38,723	14,830	15,960	—1,130	0·89	0·96	—0·07	39	
1876 ...	43·00	43·00	1·16	23,33,401	54,265	1,79,414	1,23,196	56,218	7·69	5·28	2·41	71	
1877 ...	78·00	70·69	1·55	44,48,248	57,029	2,83,922	1,93,620	90,302	6·38	4·35	2·03	77	
1878 ...	78·00	78·17	2·51	48,87,801	62,664	4,41,308	3,32,500	1,08,808	9·03	6·80	2·23	108	
1879 ...	85·00	78·09	3·55	49,99,086	58,813	4,58,733	3,50,914	1,07,819	9·18	7·02	2·16	113	
1880 ...	85·00	85·00	4·55	51,51,330	62,821	4,52,924	2,62,199	1,90,725	8·79	5·09	3·70	102	

PATNA AND GYA RAILWAY.

1879	...	57·00	36·49	0·64	28,45,078	49,914	2,30,510	1,28,723	1,01,787	8·10	4·52	3·58	121
1880	...	57·00	57·00	1·64	32,20,951	56,508	4,81,556	2,70,300	2,11,256	14·95	8·39	6·56	162

MUTTRA-HATHRAS RAILWAY.

1875	...	29·00	5·88	0·20	9,55,863	32,961	33,151	19,287	13,864	3·47	2·02	1·45	108
1876	...	29·00	29·00	1·20	9,21,560	31,778	83,406	48,159	35,247	9·05	5·23	3·82	55
1877	...	29·00	29·00	2·20	9,91,590	34,193	98,900	53,689	45,211	9·98	5·42	4·56	66
1878	...	29·00	29·00	3·20	9,93,600	34,262	98,308	52,431	45,877	9·89	5·27	4·62	65
1879	...	29·00	29·00	4·20	10,34,720	35,680	1,25,930	69,222	56,708	12·17	6·69	5·48	83
1880	...	29·00	29·00	5·20	10,88,160	37,523	1,35,226	77,556	57,670	12·43	7·13	5·30	89

CAWNPORE-FARUKHABAD RAILWAY.

1880	...	49·25	2·29	0·05	27,08,089	54,987	2,202	5,134	—2,932	0·08	0·19	—0·11	18

DILDARNAGAR-GHAZIPUR RAILWAY.

1880	...	12·00	2·89	0·24	5,63,297	46,941	8,351	10,717	—2,366	1·48	1·90	—0·42	56

RAJPUTANA RAILWAY.

1873	...	91·75	64·47	0·70	...	...	1,08,717	1,05,011	3,706	...	...	...	32
1874	...	291·75	171·30	0·80	1,32,70,992	45,488	6,18,314	4,96,548	1,21,766	4·66	3·74	0·92	69
1875	...	378·75	344·36	1·53	2,12,63,580	56,141	17,46,960	11,18,692	6,28,268	8·22	5·26	2·96	98
1876	...	399·00	393·90	2·44	2,38,46,230	60,016	23,29,592	15,23,623	8,05,969	9·77	6·39	3·38	114
1877	...	399·00	399·00	3·44	2,53,82,400	63,615	26,96,687	18,33,367	8,63,320	10·62	7·22	3·40	130
1878	...	431·25	419·41	4·16	2,83,46,980	66,128	29,72,601	18,42,130	11,30,471	10·49	6·50	3·99	136
1879	...	465·50	438·47	4·80	3,09,43,568	66,474	35,45,420	23,66,253	11,79,167	11·46	7·65	3·81	153
1880	...	489·50	470·30	5·52	3,40,61,947	69,585	37,23,719	24,90,414	12,33,305	10·93	7·31	3·62	152

Statement showing the mileage, average age, cost, &c., of all Indian Railways—continued.

Year.		Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
										Gross earnings.	Working expenses.	Net profits.		
					Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
HOLKAR AND SINDIA-NEEMUCH RAILWAY.														
1874	...	37·00	33·21	0·90	15,80,158	42,707	1,03,364	86,844	16,520	6·54	5·50	1·04	60	
1875	...	57·25	56·20	1·56	48,74,640	85,147	3,59,320	3,29,524	29,796	7·37	6·76	0·61	123	
1876	...	107·50	78·04	1·56	1,07,87,850	1,00,352	4,01,101	3,72,490	28,611	3·72	3·45	0·27	99	
1877	...	107·50	107·50	2·56	1,14,38,860	1,06,408	4,80,128	3,69,047	1,11,081	4·19	3·22	0·97	86	
1878	...	171·75	146·24	2·45	1,95,98,320	1,14,109	9,29,045	6,27,128	3,01,917	4·74	3·20	1·54	122	
1879	...	171·75	171·75	3·45	2,00,13,727	1,16,528	11,45,837	8,54,009	2,91,828	5·72	4·27	1·45	128	
1880	...	254·50	227·71	3·22	2,53,37,858	99,559	14,01,259	10,47,268	3,53,991	5·53	4·13	1·40	118	
PATRI BRANCH.														
1873	...													
1874	...													
1875	...													
1876	...													
1877	...	...					Worked by Bombay, Baroda and Central India Railway.							
1878	...													
1879	...													
1880	...													
DHOND-MANMAD.														
1878	...	145·75	108·03	0·74	71,17,400	48,863	1,35,254	1,77,195	—41,941	1·90	2·49	—0·59	24	
1879	...	145·75	145·75	1·74	95,43,500	65,478	4,67,557	4,95,222	—27,665	4·90	5·19	—0·29	62	
1880	...	145·75	145·75	2·74	1,04,58,463	71,756	6,95,094	6,06,875	88,219	6·65	5·80	0·85	91	
WARDHA COAL RAILWAY.														
1874	...	18·50	16·96	0·91	12,57,886	67,994	21,023	22,064	—1,041	16·71	17·54	—0·83	23	
1875	...	18·50	18·50	1·91	12,67,270	68,501	29,316	31,274	—1,958	2·31	2·46	—0·15	31	

1876	...	18·50	18·50	2·91	12,66,152	68,440	21,836	25,536	—3,700	1·72	2·02	—0·30	23
1877	...	46·50	23·70	1·66	45,99,370	98,911	79,087	55,555	23,532	1·72	1·21	0·51	67
1878	...	46·50	46·50	2·66	47,73,695	1,02,660	1,30,399	1,22,372	8,027	2·73	2·56	0·17	54
1879	...	46·50	46·50	3·66	47,99,450	1,03,214	1,65,158	1,34,833	30,325	3·44	2·81	0·63	69
1880	...	46·50	46·50	4·66	56,15,804	1,20,769	1,55,960	2,38,376	—82,476	2·78	4·25	—1·47	65

NAGPUR AND CHHATTISGARH RAILWAY.

1880	...	53·00	39·21	0·74	30,37,689	57,315	1,03,952	82,681	21,271	3·42	2·72	0·70	51

RANGOON AND IRRAWADDY VALLEY RAILWAY.

1877	...	161·00	108·07	0·67	88,39,650	54,905	3,44,452	4,45,584	—1,01,132	3·90	5·04	—1·14	61
1878	...	161·00	161·00	1·67	1,12,12,847	69,645	9,62,969	8,95,812	67,157	8·59	7·99	0·60	115
1879	...	161·00	161·00	2·67	1,18,94,894	73,881	9,55,918	8,14,175	1,41,743	8·04	6·85	1·19	114
1880	...	161·00	161·00	3·67	1,23,07,244	76,443	13,22,710	8,01,626	5,21,084	10·74	6·51	4·23	158

SINDIA RAILWAY.

1878	...	34·00	33·16	0·95	42,42,416	1,24,777	93,911	1,25,186	—31,275	2·21	2·95	—0·74	54
1879	...	66·50	44·68	1·15	73,20,207	1,10,078	90,916	1,22,688	—31,772	1·24	1·68	—0·44	39
1880	...	66·50	66·50	2·15	81,51,903	1,22,585	2,01,824	1,77,714	24,110	2·48	2·18	0·30	58

PUNJAB NORTHERN RAILWAY.

1875	...	62·00	44·84	0·72	54,06,934	87,209	1,42,788	90,543	52,245	2·64	1·68	0·96	61
1876	...	103·25	90·88	1·31	1,79,57,838	1,73,926	4,75,946	3,67,778	1,08,168	2·65	2·05	0·60	101
1877	...	103·25	103·25	2·31	1,70,25,460	1,64,895	6,96,761	6,04,879	91,882	4·09	3·55	0·54	130
1878	...	103·25	103·25	3·31	1,73,40,018	1,67,942	9,09,571	9,03,761	5,810	5·24	5·21	0·03	169
1879	...	103·25	103·25	4·31	2,44,93,832	2,37,228	18,50,081	14,71,192	3,78,889	7·55	6·01	1·54	345
1880	...	224·75	180·12	2·78	4,04,37,319	1,79,921	33,68,284	28,04,113	5,64,171	8·33	6·93	1·40	360

INDUS VALLEY AND KANDAHAR RAILWAYS.

1878	...	501·00	188·57	0·37	5,12,48,691	1,02,293	5,72,109	7,03,550	—1,31,441	1·12	1·38	—0·26	56
1879	...	501·00	501·00	1·37	5,70,95,291	1,13,963	31,96,316	25,69,418	6,26,898	5·60	4·50	1·10	121
1880	...	653·00	594·18	1·96	6,92,82,608	1,06,099	64,72,659	45,38,397	19,34,262	9·34	6·55	2·79	209

Statement showing the mileage, average age, cost, &c., of all Indian Railways—concluded.

Year.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
									Gross earnings.	Working expenses.	Net profits.		
				Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
WESTERN RAJPUTANA RAILWAY.													
1879	...	82·63	10·50	0·13	...	...	47,810	41,056	6,754	...	...	...	86	
1880	...	82·63	82·63	1·13	63,17,255	76,452	6,50,103	5,57,724	92,379	10·29	8·83	1·46	151	
GAEKWAR OF BARODA'S RAILWAY.													
1873	...	20·00	14·68	0·73	...	...	15,758	15,497	261	...	...	...	21	
1874	...	20·00	20·00	1·73	*4,00,000	20,000	33,087	25,074	8,013	8·27	6·27	2·00	32	
1875	...	20·00	20·00	2·73	*4,00,000	20,000	34,302	26,965	7,337	8·57	6·74	1·83	33	* Approximate.
1876	...	20·00	20·00	3·73	*4,00,000	20,000	39,776	29,971	9,805	9·94	7·49	2·45	38	
1877	...	20·00	20·00	4·73	3,82,500	19,125	46,400	36,285	10,115	12·13	9·49	2·64	45	
1878	...	20·00	20·00	5·73	3,82,500	19,125	44,891	28,022	16,869	11·74	7·33	4·41	43	
1879	...	40·25	30·65	3·61	6,67,687	16,588	72,083	40,474	31,609	10·80	6·07	4·73	46	
1880	...	57·75	49·07	3·37	11,44,210	19,813	1,28,824	63,687	65,137	11·26	5·57	5·69	51	
KHAMGAON RAILWAY.													
1870	...	8·00	6·64	0·83	...	...	10,713	19,957	—9,244	...	...	...	31	Opened for traffic on 4th March 1870.
1871	...	8·00	8·00	1·83	...	...	23,306	20,718	2,588	...	...	...	56	
1872	...	8·00	8·00	2·83	...	...	12,910	8,989	3,921	...	...	...	31	
1873	...	8·00	8·00	3·83	4,85,054	60,632	18,147	16,094	2,053	3·74	3·32	0·42	81	
1874	...	8·00	8·00	4·83	4,85,054	60,632	28,517	15,011	13,506	5·88	3·09	2·79	127	
1875	...	8·00	8·00	5·83	4,44,630	55,579	40,318	27,640	12,678	9·07	6·22	2·85	174	
1876	...	8·00	8·00	6·83	4,44,630	55,579	32,274	23,376	8,898	7·26	5·26	2·00	132	
1877	...	8·00	8·00	7·83	4,85,054	60,632	50,996	31,473	19,517	10·51	6·49	4·02	154	
1878	...	8·00	8·00	8·83	4,71,140	58,892	52,991	21,539	31,452	11·25	4·57	6·68	191	
1879	...	8·00	8·00	9·83	5,23,328	65,416	38,086	38,350	—264	7·28	7·33	—0·05	146	
1880	...	8·00	8·00	10·83	5,08,187	63,523	27,363	23,106	4,257	5·38	4·55	0·83	98	

AMRAOTI RAILWAY.

1871	...	6·00	5·24	0·87	...	...	19,085	13,956	5,129	...	...	...	70	Opened for traffic on 6th February 1871.
1872	...	6·00	6·00	1·87	...	...	23,025	20,268	2,757	...	...	...	74	
1873	...	6·00	6·00	2·87	4,37,278	72,880	24,124	27,745	—3,621	5·52	6·34	—0·82	77	
1874	...	6·00	6·00	3·87	4,37,278	72,880	31,615	30,434	1,181	7·23	6·96	0·27	101	
1875	...	6·00	6·00	4·87	4,00,840	66,807	58,106	45,039	13,067	14·49	11·23	3·26	186	
1876	...	6·00	6·00	5·87	4,37,278	72,880	69,166	48,863	20,303	15·82	11·17	4·65	212	
1877	...	6·00	6·00	6·87	4,37,278	72,880	80,092	27,383	52,709	18·31	6·26	12·05	257	
1878	...	6·00	6·00	7·87	4,25,848	70,975	89,124	38,980	50,144	20·92	9·15	11·77	286	
1879	...	6·00	6·00	8·87	4,65,695	77,617	69,904	53,728	16,176	15·01	11·54	3·47	224	
1880	...	6·00	6·00	9·87	4,34,261	72,377	50,865	47,226	3,639	11·71	10·87	0·84	163	

NIZAM'S RAILWAY.

1874	...	121·00	27·85	0·23	99,32,120	82,084	1,15,230	1,09,482	5,748	1·16	1·10	0·06	79	
1875	...	121·00	121·00	1·23	1,03,75,760	85,750	4,96,519	5,63,904	—67,385	4·79	5·44	—0·65	79	
1876	...	121·00	121·00	2·23	1,06,23,010	87,793	5,81,738	4,98,674	83,064	5·48	4·69	0·79	92	
1877	...	121·00	121·00	3·23	1,15,06,385	95,094	8,30,768	6,44,081	1,86,687	7·22	5·60	1·62	132	
1878	...	121·00	121·00	4·23	1,14,59,384	94,706	7,91,753	6,79,907	1,11,846	6·91	5·93	0·98	126	
1879	...	121·00	121·00	5·23	1,16,10,466	95,954	6,94,401	6,04,476	89,925	5·98	5·21	0·77	110	
1880	...	121·00	121·00	6·23	1,20,62,228	99,688	7,02,716	4,78,407	2,24,309	5·83	3·97	1·86	112	

Abstract of statement showing the mileage, average age, cost, and general results of working of all Indian Railways up to the year 1880.

[*N.B.*—Steam Boat earnings and expenses have been excluded from these figures.]

Number.	RAILWAYS.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of			Gross earnings per mile per week.	Remarks.
										Gross earnings.	Working expenses.	Net profits.		
					Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
	BROAD GAUGE.													
	5 FEET 6 INCHES.													
1	East Indian ...	1,504·25	1,504·25	17·73	33,03,98,294	2,19,643	4,29,14,430	1,41,53,658	2,87,60,772	12·99	4·28	8·71	549	
2	Eastern Bengal ...	158·00	158·00	15·70	3,31,68,524	2,08,935	44,51,318	19,07,547	25,43,771	13·42	5·75	7·67	540	
3	Oudh and Rohilkhand	546·75	546·75	8·28	5,77,96,380	1,05,709	44,55,150	25,50,740	19,04,410	7·71	4·41	3·30	157	
4	Sind, Punjab and Delhi	663·50	663·50	14·65	11,04,52,484	1,66,470	1,21,67,588	63,84,358	57,83,230	11·02	5·78	5·24	352	
5	Madras ...	858·00	858·00	16·76	11,08,55,385	1,29,202	61,62,545	42,05,409	19,57,136	5·56	3·79	1·77	138	
6	Great Indian Peninsula	1,275·75	1,275·75	16·20	24,99,77,200	1,95,946	2,49,53,253	1,38,47,702	1,11,05,551	9·98	5·54	4·44	372	
7	Bombay, Baroda and Central India.	*444·00	444·00	14·94	8,28,42,480	1,86,582	82,44,375	35,08,452	47,35,923	9·95	4·23	5·72	355	
8	Calcutta and South-Eastern.	28·00	28·00	18·36	66,39,843	2,37,137	1,42,098	1,01,344	40,754	2·14	1·53	0·61	98	
9	Patna-Gya ...	57·00	57·00	1·64	32,20,951	56,508	4,81,556	2,70,300	2,11,256	14·95	8·39	6·56	162	
10	Dildarnagar-Ghazipur	12·00	2·89	0·24	5,63,297	46,941	8,351	10,717	—2,366	1·48	1·90	—0·42	56	
11	Dhond and Manmad	145·75	145·75	2·74	1,04,58,463	71,756	6,95,09	6,06,875	88,219	6·65	5·80	0·85	91	
12	Wardha Coal ...	46·50	46·50	4·66	56,15,904	1,20,769	1,55,9X	2,38,376	—82,476	2·78	4·25	—1·47	65	
13	Sindia	66·50	66·50	2·15	81,51,903	1,22,585	2,01,82[illegible]	1,77,714	24,110	2·48	2·18	0·30	58	
14	Punjab Northern ...	224·75	180·12	2·78	4,04,37,319	1,79,921	33,68,23[illegible]	28,04,113	5,64,171	8·33	6·93	1·40	360	
15	Indus Valley ...	653·00	594·18	1·96	6,92,82,609	1,06,099	64,72,659	45,38,397	19,34,262	9·34	6·55	2·79	209	
16	Khamgaon ...	8·00	8·00	10·83	5,08,187	63,523	27,363	23,106	4,257	5·38	4·55	0·83	98	
17	Amraoti	6·00	6·00	9·87	4,34,261	72,377	50,865	47,266	3,639	11·71	10·87	0·84	163	
18	Nizam's	121·00	121·00	6·23	1,20,62,228	99,688	7,02,716	4,78,407	2,24,309	5·83	3·97	1·86	112	
	Total and average ...	6,818·75	6,706·19	13·09	1,13,28,65,611	1,66,140	11,56,55,369	5,58,54,441	5,98,00,928	10·21	4·93	5·28	325	

* Including Patri Branch.

Abstract of statement showing the mileage, average age, cost, and general results of working of all Indian Railways up to the year 1880—continued.

Number.	RAILWAYS.	Miles open at end of year.	Mean mileage open during year.	Mean age of lines at end of year.	Capital outlay at close of year.	Cost per mile open.	Gross earnings during year.	Working expenses during year.	Net profits of year.	Percentage on Capital cost of: Gross earnings.	Working expenses.	Net profits.	Gross earnings per mile per week.	Remarks.
					Rs.	Rs.	Rs.	Rs.	Rs.				Rs.	
	NARROW GAUGE.													
	METRE.													
1	South Indian ...	645·25	637·26	7·61	4,16,72,963	64,584	35,59,594	26,29,576	9,30,018	8·54	6·31	2·23	106	
2	Nalhati	27·25	27·25	17·03	3,25,216	11,934	69,925	73,653	—3,728	21·50	22·65	—1·15	49	4 feet gauge.
3	Northern Bengal ...	243·50	243·50	3·03	1,96,73,726	80,796	14,49,296	8,54,386	5,94,910	7·36	4·34	3·02	114	
4	Tirhoot	85·00	85·00	4·55	51,51,330	62,821	4,52,924	2,62,199	1,90,725	8·79	5·09	3·70	102	
5	Muttra-Hathras ...	29·00	29·00	5·20	10,88,160	37,523	1,35,226	77,556	57,670	12·43	7·13	5·30	89	
6	Cawnpore and Farukhabad.	49·25	2·29	0·05	27,08,089	54,987	2,202	5,134	—2,932	0·08	0·19	—0·11	18	
7	Nagpur and Chhattisgarh.	53·00	39·21	0·74	30,37,689	57,315	1,03,952	82,681	21,271	3·42	2·72	0·70	51	
8	Rangoon and Irrawaddy Valley.	161·00	161·00	3·67	1,23,07,244	76,443	13,22,710	8,01,626	5,21,084	10·74	6·51	4·23	158	
9	Rajputana ...	469·50	470·30	5·52	3,40,61,947	69,585	37,23,712	24,90,414	12,33,305	10·93	7·31	3·62	152	
10	Holkar and Sindia-Neemuch.	254·50	227·71	3·22	2,53,37,858	99,559	14,01,259	10,47,268	3,53,991	5·53	4·13	1·40	118	
11	Western Rajputana ...	82·63	82·63	1·13	63,17,255	76,452	6,50,103	5,57,724	92,379	10·29	8·83	1·46	151	
12	His Highness the Gaekwar's.	57·75	49·07	3·37	11,44,210	19,813	1,28,825	63,687	65,137	11·26	5·57	5·69	51	2 feet 6 inch gauge.
	Total and average ...	2,177·63	2,054·22	5·30	15,28,25,681	70,180	1,29,99,734	89,45,904	40,53,830	8·50	5·85	2·65	122	
	Total and average Guaranteed.	6,095·50	6,087·51	14·76	1,01,71,63,710	1,66,871	10,69,08,253	4,91,87,442	5,77,20,811	10·51	4·84	5·67	337	
	Total and average State	2,900·88	2,672·90	3·72	26,95,27,582	92,568	2,17,46,850	1,56,12,903	61,33,947	8·10	5·81	2·29	156	
	GRAND TOTAL AND AVERAGE.	8,996·38	8,760·41	11·20	1,28,56,91292	1,42,912	12,86,55,103	6,48,00,345	6,38,54,758	10·01	5·04	4·97	282	

Return of Locomotive Stock on all Indian Railways on 31st December 1880.

ENGINES.	East Indian.	Eastern Bengal.	Oudh & Rohilkhand.	Sind, Punjab and Delhi.	Madras.	South Indian.	Great Indian Peninsula.	Bombay, Baroda and Central India.	Calcutta and South-Eastern.	Nalhati.	Northern Bengal.	Tirhoot.	Patna-Gya.	Mutfra-Hathras.	Cawnpore-Farukhabad.	Dildarnagar-Ghazipur.	Dhond and Manmad.	Wardha Coal.	Nagpur and Chhattisgarh.	Rangoon and Irrawaddy Valley.	Sindia, Northern Section.	Sindia, Southern Section.	Rajputana.	Western Rajputana.	Holkar and Sindia-Neemuch.	Punjab Northern.	Indus Valley and Kandahar.	Khamgaon.	Amraoti.	Nizam's.	Gackwar of Baroda's.	Remarks.
Tank, Mail ...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Worked by the East Indian Railway.	Worked by the Great Indian Peninsula Railway.	...	...	...	Worked by the East Indian Railway.	...	...	...	...	...	...	...	Worked by the Great Indian Peninsula Railway.	...	...	...	
Tank ...	...	...	...	...	18	4	59	8	1	6	...	1	...	...	...			...	...	...		...	18	5	...	...	5	2		...	...	
Tank, Goods ...	5	...	3	...	...	...	...	(a)	...	...	...	...	...	...	...			...	...	...		...	...	...	...	...	...	...		...	...	
Goods ...	462	...	90	18	137	78	277	33	5	...	7	...	...	...	...			...	...	...		...	...	...	...	9	...	...		...	...	
Mixed Engines ...	...	...	28	...	...	(b)2	...	...	...	...	...	...	...	...	...			...	...	...		...	...	...	...	55	70	...		...	6	
Inspection Engines ...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	...	...	...	...	...		...	...	
Passengers, 4 wheels coupled ...	...	...	...	121	...	...	...	...	...	...	33	...	...	...	...			...	...	...		...	...	...	...	...	...	...		...	...	
Tender ...	...	...	...	...	...	...	...	...	...	...	...	9	...	...	...			...	...	...		...	85	30	...	...	...	...		(c)10	...	
Tank, 4 wheels coupled ...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	1			...	...	...		...	...	...	...	...	...	...		...	...	
Narora ...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...			...	...	...		...	...	...	...	...	...	...		...	...	
Neilson & Co.'s, Class E ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10			...	...	...		...	...	5	...	...	...	...		...	...	
A Class Engine ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	3	...		...	...	...	...	...	...	...		...	...	
B ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			2	...	...		...	...	...	...	...	...	...		...	...	
E ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	21	...		...	...	...	...	...	...	...		...	...	
E2 ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	3	...		...	...	...	...	...	...	...		...	...	
F ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			10	4	...		...	...	...	...	...	...	...		...	...	
Avonside Engine Works, Bristol ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		4	...	...	...	...	...	...		...	...	
Bogie, B and C Classes ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	38	...	...	...	...	...		...	...	
Narana Engine ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	1	...	...	...	...	...		...	...	
Dübs & Co.'s, Classes A, B and F ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	17	...	...	...	...		...	...	
Nasmyth & Co.'s, Classes B and C ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	10	...	...	...	...		...	...	
Yorkshire Engine Co.'s, Class F ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	20	...	...	...	...		...	...	
Kitson and Stevenson ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	...	...	12	...	...		...	...	
Sharp, Stewart & Co. ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...		...	...	...	...	11	...	...		...	...	
Passenger ...	64	48	20	2	24	102	(d)47	4	...	...	...	6	...	...	...			5	...	...		...	...	...	...	...	...	...		...	...	
TOTAL ...	536	48	123	159	157	108	438	88	10	6	40	10	6	5	11			5	12	31		4	142	35	52	64	93	2		10	6	

(a) Included with passenger engines (*see d*). (b) Converted from 3' 6" gauge. (c) 9 of these are Dübs' H class, and 1 of Slaughter and Grunning & Co. (d) Include tank, goods.

Return of Coaching Stock on all Indian Railways on 31st December 1880.

Coaching Vehicles.	East Indian.	Eastern Bengal.	Oudh & Rohilkhand.	Sind, Punjab and Delhi.	Madras.	South Indian.	Great Indian Peninsula.	Bombay, Baroda and Central India.	Calcutta and South-Eastern.	Nalhati.	Northern Bengal.	Tirhoot.	Patna-Gya.	Muttra-Hathras.	Cawnpore-Farukhabad.	Dildarnagar-Ghazipur.	Dhond and Manmad.	Wardha Coal.	Nagpur and Chhattisgarh.	Rangoon and Irrawaddy Valley.	Sindia, Northern Section.	Sindia, Southern Section.	Rajputana.	Western Rajputana.	Holkar and Sindia-Neemuch.	Punjab Northern.	Indus Valley and Kandahar.	Khamgaon.	Amraoti.	Nizam's.	Gackwar of Baroda's.	Remarks.
Royal Saloon ...	2	...	...	...	1	3	...	...	...	...	...	...	...	...	...	East Indian Railway.	...	...	...	...	East Indian Railway.	...	3	...	...	...	...	...	...	...	...	
Saloon Carriages ...	...	4	...	...	18	...	2	...	1	...	...	1	...	...	...		1	...	...	...		1	4	...	...	3	2	...	...	1	2	
,, Tender ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	1	...	...	...	...	...	
Family Carriages ...	21	...	...	...	...	...	4	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
First Class ,, ...	81	7	...	26	5	(a)25	45	(b)16	...	2	21	9	2	...	...		4	2	2	7		1	39	9	15	10	15	...	...	...	...	
Composite ,, ...	17	16	2	24	28	(c)17	92	18	5	...	9	1	2	...	...		2	12	...	12		...	10	3	9	8	4	...	...	...	...	
Second Class ,, ...	99	8	36	28	58	(d)30	151	25	...	1	6	3	2	...	...		...	4	4	14		...	43	3	9	11	(e)17	...	...	7	3	
Intermediate Class Carriages ...	53	...	...	22	...	...	...	...	...	...	10	...	...	...	...		...	...	...	...		...	12	...	...	...	...	...	...	...	...	
Third Class Carriages ...	435	(g)53	...	267	253	(h)304	288	195	20	6	53	28	20	24	7		12	3	4	30		(j) 11	212	47	12	78	(f)123	...	...	...	...	
Fourth Class ,, ...	...	57	(l)206	...	...	...	160	...	...	...	...	...	...	...	...		...	4	6	...		...	162	...	82	...	...	...	...	...	22	
Third and Fourth Class Composite Carriages. ...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Third Class Burmese ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	83		...	...	...	...	...	...	...	...	...	...	
Sleeping Carriages ...	...	10	...	...	6	...	31	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Double-tiered Carriages ...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Reserved ,, ...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	1	...	...	...	...	...	...	...	...	
,, Attendants' ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	1	...	...	...	...	...	
Hospital ,, ...	3	...	...	1	(m)2	...	6	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	(n)6	...	...	...	...	...	...	
Officers' or Inspection ,, ...	...	...	4	...	2	...	1	...	...	...	...	...	...	...	...		...	...	1	...		1	3	...	...	4	3	...	...	...	...	
Dynamometer Carriages ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	1	...	...	...	...	...	...	...	...	
Post-Office Vans ...	20	(p)	(l)	13	...	16	5	(r) 7	...	...	3	...	...	...	...		2	...	...	30		...	(s) 14	...	...	2	...	...	...	...	...	
,, ,, Brakes ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	2	...	...	...	...	...	...	...	...	
Brake Vans ...	117	18	67	76	137	(t) 40	331	18	3	...	38	12	3	4	4		...	...	6	30		2	113	27	39	...	53	4	...	...	...	
Prison ,, ...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	1	...	...	...	...	...	...	...	...	
Luggage ,, ...	...	...	...	12	12	...	...	...	...	...	3	...	...	...	...		...	...	...	...		...	4	...	...	...	9	4	...	...	...	
Sheep and Poultry Vans ...	...	...	...	1	...	...	28	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Compound 3rd Class incline Vans ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Through Luggage Vans ...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Road Vans ...	...	...	...	...	...	...	...	12	...	...	...	...	...	...	...		2	...	...	...		...	...	...	...	...	...	...	...	...	...	
Cooking ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	2	...	...	...	...	...	...	...	...	
Produce Wagons ...	...	...	...	...	...	...	...	...	25	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...	
Horse Boxes ...	75	6	27	43	46	20	93	15	2	1	10	3	1	...	...		...	...	8	...		...	25	6	10	12	17		...	7	...	
Carriage Trucks ...	39	4	...	21	21	4	27	4	2	1	3	3	1	...	...		2	...	...	...		...	17	2	9	12	8		...	2	...	
Total ...	982	192	332	550	589	459	1,314	310	58	11	158	60	31	32	11	...	27	9	19	184	...	16	506	97	193	141	253	...	...	65	27	

(a) 3 converted from 3′ 6″ gauge.

(b) Includes saloon carriages.

(c) 4 converted from 3′ 6″ gauge.

(d) 6 converted from 3′ 6″ gauge.

(e) Half of 6 carriages allotted to Postal Service.

(f) 3-5ths of 7 carriages allotted to Postal Service.

(g) 6 third class carriages are provided with accommodation for Postal Service.

(h) 20 converted from 3′ 6″ gauge.

(j) Including 4 covered goods wagons temporarily fitted as third class.

(k) Including 4th class carriages.

(l) One-third of 16 lower class carriages is used as Postal vans.

(m) Invalid carriages.

(n) Including 6 combined 3rd class and Post-Office vans.

(p) 6 third class carriages are provided with accommodation for Postal Service.

(r) 3rd class invalid vans.

(s) Including 8 combined 3rd class and Post Office vans.

(t) 3 converted from 3′ 6″ gauge.

Return of Goods Stock on all Indian Railways on 31st December 1880.

Goods Vehicles.	East Indian.	Eastern Bengal.	Oudh & Rohilkhand.	Sind, Punjab and Delhi.	Madras.	South Indian.	Great Indian Peninsula.	Bombay, Baroda and Central India.	Calcutta and South Eastern.	Nalhati.	Northern Bengal.	Tirhoot.	Patna-Gya.	Mutihra-Hathras.	Cawnpore-Farukhabad.	Dildarnagar-Ghazipur.	Dhond and Manmad.	Wardha Coal.	Nagpur and Chhattisgarh.	Rangoon and Irrawaddy Valley.	Sindia, Northern Section.	Sindia, Southern Section.	Rajputana.	Western Rajputana.	Holkar and Sindia-Neemuch.	Punjab Northern.	Indus Valley and Kandahar.	Khamgaon.	Amraoti.	Nizam's.	Gaekwar of Baroda's.	Remarks.
Covered goods wagons ...	4,819	335	2,642	2,277	40	787	3,503	961	140	15	566	171	59	54	150		14	35	183	481		14	1,515	235	513	731	895			55	26	
High-sided ,, ...	1,223	76	72	108	...	397	1,152	26	72	...	...	...	...	...	...		...	...	152	30		...	(a)97	...	...	197	175			44	...	
Open-sided ,, ...		...	...	...	2,200	...	...	...	24	9	101	26	40	...	...		...	...	...	...		...	...	...	8	...	...			...	155	
Low-sided ,, ...	...	...	121	747	...	(b)20	2,550	303	...	...	...	44	...	19	...		...	60	...	60		2	466	100	104	140	269			...	...	
Coke ,, ...	91	...	...	...	158	...	...	...	...	...	...	...	...	...	...		...	60	...	...		...	...	...	...	...	...			...	...	
Ballast ,, ...	...	50	...	...	217	150	280	175	...	...	...	...	...	...	...		86	...	...	50		...	163	100	135	21	65			...	...	
Iron cylindrical ,, ...	...	270	...	...	...	...	...	...	4	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Sample ,, ...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Iron rectangular ,, ...	...	200	...	...	...	...	...	...	...	...	60	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Open jute ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Tank ,, ...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Travelling tank ,, ...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Covered goods (for ambulance purposes). ...		1	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Goods brake vans ...	178	13	...	27	...	30	37	31	5	...	...	...	...	...	...		(c)15	6	12	...		...	...	...	...	85	...			18	6	
Cattle ,, ...	53	4	6	...	43	6	97	18	1	...	...	5	...	...	...		...	...	1	6		...	14	...	...	...	...			...	...	
Sheep ,, ...	...	...	...	...	...	...	...	12	...	...	...	...	...	...	...		2	...	...	...		...	20	2	7	8	4			...	...	
Powder ,, ...	31	1	4	...	3	3	17	6	...	...	2	1	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Treasure ,, ...	...	...	...	17	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	1	...	...	...	...			...	...	
Salt ,, ...	...	...	...	...	...	37	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Store delivery ,, ...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...		...	...	...	...		...	5	...	...	...	...			(d) 1	...	
Tools ,, ...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...		...	...	...	(e) 2		...	...	...	2	...	...			...	...	
Light material ,, ...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...		(f) 1	...	...	18		...	32	...	16	36	8			...	6	
Fish ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	8	...		...	...	...	...	...	79			...	...	
Relief ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Coal-hoppers ...	1,151	...	...	1	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Timber trucks ...	127	15	157	...	106	29	141	55	2	...	16	4	...	2	...		...	...	...	...		...	...	...	...	...	...			...	...	
Platform ,, ...	44	...	...	20	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Bogie ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Six-wheeled ,, ...	...	...	...	177	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Water ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Cotton ,, ...	...	...	...	...	...	89	...	1,113	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Boiler ,, ...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Pilot ,, ...	...	...	...	...	...	...	25	...	...	...	...	...	...	...	...		1	...	...	...		...	...	...	...	...	...			...	...	
Fuel ,, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	14	...	...	3	50			...	...	
Iron water tank ...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	14			...	...	
Oil ...	...	...	...	5	...	...	12	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Travelling Cranes ...	...	...	6	...	3	1	38	...	1	...	6	...	...	...	...		1	...	...	4		...	...	(g) 2	...	...	9			1	...	
Miscellaneous ...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...			...	...	
Rail carriers ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	1	267			...	...	
TOTAL ...	7,730	966	3,008	3,384	2,774	1,550	7,852	2,701	252	24	780	252	101	75	150		120	161	356	651		16	2,327	439	785	1,222	1,835	...	...	119	193	

(a) Including 31 high-sided (horse) wagons. (b) Converted from 3' 6" gauge. (c) Including 6 ballast brake vans. (d) Accident vans. (e) Plank wagons. (f) Dummy guard's van. (g) Accident cranes.

TABLE OF APPENDICES.

		PAGE
APPENDIX A.	STATEMENT SHOWING LENGTH OF RAILWAYS IN INDIA CONSTRUCTED AND IN PROGRESS, TOGETHER WITH NAMES OF CHIEF OFFICERS ADMINISTERING THEM	i
,,	B.—NEW CONTRACT WITH THE EAST INDIAN RAILWAY COMPANY ...	v
,,	C.—AGREEMENT BETWEEN THE SECRETARY OF STATE FOR INDIA AND THE BENGAL CENTRAL RAILWAY COMPANY ...	xv
,,	D.—PROCEEDINGS OF THE RAILWAY CONFERENCES HELD IN CALCUTTA IN 1879 AND 1880	xxv
,,	E.—EFFECTS OF WIND PRESSURE UPON RAILWAY STRUCTURES ...	xlv
,,	F.—STATEMENT SHOWING EXTENT OF EMPLOYMENT OF NATIVES AS ENGINE DRIVERS AND SHUNTERS ON INDIAN RAILWAYS DURING 1880	liii

APPENDIX A.

Statement showing the length of all the Railways in India constructed, in progress, and under survey on 1st January 1881, together with the names of the Officers who have served as Heads of Departments on each line during the year 1880.

Gauge.	Railway.	Total length open on 1st January 1881.	Under construction.	Under survey or not yet commenced.	Heads of Departments. Agent or Manager.	Engineering Department.	Traffic Department.	Locomotive Department.	Audit and Accounts.	Remarks.
	STATE.									
	Punjab and Sind.									
5′ 6″	Punjab Northern	226 (1)	122 (3)	...	Captain W. Sedgwick.	Captain W. Sedgwick.	C. J. Keene	A. B. Thomson.	Captain J. S. Biscoe.	(1) Lahore to Haji Shah (Attock). (2) Lala Musa to Miani. (3) Haji Shah to Peshawar, 50 miles. Turnool to Kushalgarh, 72 miles.
3′ 3½″	Punjab Northern	54 (2)	...	...	Major E. L. Marryat from November 1880.	Major E. L. Marryat from November 1880.	.....	.....	Captain A. G. Begbie from November 1880.	
5′ 6″	Indus Valley ...	501	...	...	Captain T. B. H. Savi.	R. T. Mallet J. Ramsay from November 1880.	G. F. Mathew	G. E. Thomas	J. S. Hubbard. R. K. Williams from September 1880.	
5′ 6″	Kandahar ...	153 (4)	41 (5)	257 (6)	.....	H. F. Storey	.....	.....	.....	(4) Ruk to Sibi, 133 miles. Sibi to Pir Chauki, 19 miles. (5) Sibi to Spintangi (since discontinued). (6) Spintangi to Kandahar, 239 miles. Branch to Quetta, 18 miles.
5′ 6″	Amritsar-Pathankot	...	...	65	.....	.....	.....	.....	.....	
	North-Western Provinces Provincial.									
3′ 3½″	Muttra-Hathras ...	29	...	...	C. W. E. Henslowe.	C. W. E. Henslowe.	C. W. E. Henslowe.	W. C. Gibbons.	H. Marten.	
3′ 3½″	Muttra-Achneyra ...	...	23½	...	.....	.....	.....	.....	.....	
3′ 3½″	Cawnpore-Farukhabad.	49½	36½ (7)	102 (8)	C. W. E. Henslowe.	E. L. Hunt. C. W. E. Henslowe from February 1880.	C. W. E. Henslowe.	W. C. Gibbons.	H. Marten H. Rainer from December 1880.	(7) Miran Serai to Farukhabad. (8) Extension from Farukhabad to Hathras.
5′ 6″	Dildarnagar-Ghazipur.	12 (9)	...	...	.....	G. V. Martyr to December 1880.	.....	.....	.....	(9) Worked by East Indian Railway from December 1880.
5′ 6″	Bhaupur-Kalpi ...	...	...	33	.....	G. H. List	.....	.....	.....	
3′ 3½″	Bareilly-Pilibhit ...	...	...	33	.....	C. V. MacIvor	.....	.....	.....	
	Bengal Provincial.									
5′ 6″	Calcutta and South-Eastern.	28	15 (10)	13¾ (11)	R. G. Mookerjee.	Chief Engineer, Bengal.	R. G. Mookerjee.	A. W. Rendell.	F. P. Quinlan	(10) Sonapur to Magra Hat. (11) Magra Hat to Diamond Harbour.
4′ 0″	Nalhati ...	27½	...	...	Ditto	Ditto	Ditto	Ditto	Ditto.	
3′ 3½″ 5′ 6″	Northern Bengal	230¾ 13 (12)	...	73 (13)	Captain W. A. J. Wallace.	Captain W. A. J. Wallace.	G. M. Drury	Ditto	Ditto	(12) Poradaha Section worked by Eastern Bengal Railway. (13) Teesta river to Dhubri, 53 miles. Parbatipur to Dinagepur, 20 miles.
3′ 3½″ 5′ 6″	Tirhoot ...	82½ 2½ (14)	102 (15)	65 (16)	V. Rigby ...	V. Rigby ...	W. M. Johnstone. A. W. N. Pope from May 1880.	..... H. M. Cardew	..... J. Douglas	(14) Barrh Branch worked by East Indian Railway. (15) Muzaffarpur to Bettiah, 78 miles. Durbhanga to Pipra Ghat, 24 miles. (16) Pipra Ghat extension, 30 miles. Muzaffarpur to Hajipur, 35 miles.
5′ 6″	Patna-Gya ...	67	...	80 (17)	Ditto	Ditto	Ditto	Ditto	Ditto	(17) Gya to Palamow.
...	Dacca-Mymensingh	...	...	128	.....	.....	.....	.....	.....	

Statement showing the length of all the Railways in India constructed, in progress, and under survey on 1st January 1881, &c.—continued.

Gauge.	Railway.	Total length open on 1st January 1881.	Under construction.	Under survey or not yet commenced.	Heads of Departments. Agent or Manager.	Engineering Department.	Traffic Department.	Locomotive Department.	Audit and Accounts.	Remarks.
	STATE—*contd.*									
	Bombay and Central India.									
3′ 3½″ / 5′ 6″	Rajputana ...	725½ (18) / 1½ (19)	...	...	Major W. S. S. Bisset.	B. W. Blood	J. O'Callaghan. P. D. Barelay from March 1880.	F. N. Gutersloh. W. R. S. Jones (Carriage and Wagon).	Lieut.-Col. E. M. Moberly.	(18) Includes Western Rajputana Railway. (19) Agra Fort station to East Indian Railway station.
3′ 3½″	Holkar and Sindia-Neemuch.	254½	135½ (20)	...	H. Dangerfield. C. H. Croudace from September 1880.	H. Dangerfield. C. H. Croudace from September 1880.	W. E. Hart	C. M. Davies	J. W. Fordham.	(20) Neemuch to Chittor, 33 miles, since opened in March 1881.
5′ 6″	Sindia ...	66½ (21)	8½ (22)	100 (23)	.....	.....	.....	.....	.....	(21) Worked by East Indian Railway. (22) Chambal bridge and approaches opened 15th May 1881. (23) Gwalior to Mau-Ranipur.
5′ 6″	Patri ...	22½ (24)	...	...	.....	.....	.....	.....	.....	(24) Worked by Bombay, Baroda and Central India.
5′ 6″	Dhond-Manmad ...	145½ (25)	...	...	Major W. J. Eggleden. E. H. Hallum from 6th December 1880.	E. H. Hallum	W. J. Chamberlain.	E. W. M. Hughes.	W. H. Brand	(25) Worked by Great Indian Peninsula Railway from November 1880.
...	Bombay Eastern Deccan (26).	...	...	173½	.....	W. L. Buyers	.....	.....	.....	(26) Provincial.
5′ 6″	Barsi Road to Pandharpur.	...	...	33	.....	E. H. Hallum	.....	.....	.....	Proposed branches from Great Indian Peninsula Railway.
5′ 6″	Barsi Road to Barsi	...	...	20½	.....	.....	.....	.....	.....	
3′ 3½″	Karwar ...	...	...	204½ (27)	.....	.....	.....	.....	.....	(27) A portion of the earthwork from Bellary to Hospett was carried out as a famine work in 1877.
...	Marmagao-Hubli ...	...	...	124 (28)	.....	W. L. Buyers	.....	.....	.....	(28) Preliminary survey made.
	Central Provinces.									
5′ 6″	Wardha Coal ...	46½	...	...	J. Y. Davidson.	J. Y. Davidson.	J. W. Hartley	G. B. Reynolds.	F. L. Brown	
3 3½″	Nagpur-Chhattisgarh.	53 (29)	75¾ (30)	135 (31)	Ditto	Ditto	Ditto	J. Y. Davidson.	Ditto ...	(29) Nagpur to Tumsar. (30) 50th mile to Dongargarh. (31) Dongargarh to Bilaspur.
	Burma Provincial.									
3′ 3½″	Rangoon and Irrawaddy Valley.	161	...	42 (32)	H. M. Mathews.	H. M. Mathews.	A. E. Adie	H. T. Ferguson.	S. M. Johnson.	(32) Prome to Allanmyo.
3′ 3½″	Rangoon and Sittang Valley.	...	...	163½	.....	.....	.....	.....	.....	
	Assam.									
...	Dibrugarh-Sadiya	...	...	75	.....	.....	.....	.....	.....	
	Native States.									
3′ 3½″	Jodhpur ...	...	17 (32*a*)	42 (32*b*)	.....	.....	.....	.....	.....	(32*a*) Kharchi to Pali. (32*b*) Pali to Jodhpur.
5′ 6″	Bhopal ...	...	62 (33)	104 (34)	.....	H. T. Geoghegan.	.....	.....	.....	(33) Itarsi to Bhopal. (34) Bhopal towards Jhansi.
3′ 3½″	Bhavnagar-Gondal (35).	105	87½ (36)	...	.....	A. Izat ...	.....	J. Rhind ...	J. B. Braddon	(35) From Bhavnagar to Wadhwan and Dhoraji. (36) Dhola to Dhoraji opened 19th January 1881.
2′ 6″	Gaekwar of Baroda's (37).	56½	2	...	.....	.....	.....	.....	.....	(37) Constructed and worked by Bombay, Baroda and Central India Railway.
5′ 6″ / 5′ 6″	Berars Branches: Khamgaon / Amraoti.	8 / 6	... / ...	... / ... (38)	.....	.....	.....	.....	...	(38) Worked by Great Indian Peninsula Railway.

Statement showing the length of all the Railways in India constructed, in progress, and under survey on 1st January 1881, &c.—continued.

Gauge.	Railway.	Total length open on 1st January 1881.	Under construction.	Under survey or not yet commenced.	Heads of Departments. Agent or Manager.	Engineering Department.	Traffic Department.	Locomotive Department.	Audit and Accounts.	Remarks.
	STATE—*concld.*									
	Native States—contd.									
5′ 6″	Nizam's ...	121	...	...	Lieut. F. T. Maxwell.	Lieut. F. T. Maxwell.	W. Sandford	E. W. M. Hughes.	F. Morrison.	
3′ 3⅜″ / 5′ 6″	Mysore ...	3 (39)	85½ (40)	...	.....	Major A. Le Messurier.	.....	.....	.....	(39) Bangalore cantonment to Bangalore city worked by Madras Railway Company. (40) 58 miles since opened to Mandya.
	GUARANTEED COMPANIES.									
5′ 6″	Sind, Punjab and Delhi. Punjab Section.	553½	...	...	R. Bocquet	C. Stone (41)	D. Ross ...	C. Sandeford	J. Lightfoot	(41) Officiating from 1st January 1880 to 7th June 1880.
	Sind Section.	109½	...	...	.....	T. A. Cox ... L. H. Michel (42).	.....	W. Bocquet	.....	(42) Officiating from 8th June 1880 to 31st December 1880.
5′ 6″	Oudh and Rohilkhand.	546½	5½ (43)	...	Col. J. H. Jenkins.	H. B. Hedersteadt.	S. Hartwell...	J. G. Cooke	G. O. Smith	(43) Benares bridge.
5′ 6″	Eastern Bengal ...	158½	...	...	F. Prestage...	W. Nicholson	T. Brander ...	T. Hindmarsh	G. L. Calder.	
5′ 6″	Bombay, Baroda and Central India.	421½	...	...	F. Mathew ...	F. Mathew ...	J. R. Duxbury.	B. B. Carroll	J. O'Connell. N. Morhouse acting.	
5′ 6″	Great Indian Peninsula.	1,288	...	...	G. A. Barnet	Wilson Bell	H. Conder ...	S. Jackson ...	E. V. Jordan.	
5′ 6″	Madras ...	860½	...	...	A. M. Saunders.	W. E. Robinson.	H. E. Church	F. H. Treirthick.	F. Church.	
3′ 3⅜″	South Indian ...	653½	...	...	W. S. Betts...	D. Logan ...	A. Stanton ...	E. G. Sheward. J. M. Budge acting.	J. Smith.	
5′ 6″	EAST INDIAN ...	1,504½	6½ (44)	...	Bradford Leslie.	Bradford Leslie.	N. St. L. Carter.	D. W. Campbell. R. Pearce, Carriage Superintendent.	R. C. S. Mackenzie.	New contract between the Secretary of State and the Company came into force on 1st January 1880. (44) Bhadreswar Branch, 2½ miles. Hooghly Bridge Branch, 4 miles.
	SUBSIDISED COMPANY.									
5′ 6″	Bengal Central ...	...	...	247	.....	.....	.....	.....	.....	Section from Ranaghat to Jessore and Kulna, 82½ miles, and from Bongong to Calcutta, 47 miles, have been undertaken by the Bengal Central Railway Company. Work was commenced on 12th May 1881.
	Total for East Indian and Guaranteed Railways ...	6,096½	12							

GOVERNMENT ADMINISTRATION.

The following Officers of Government were more or less directly connected with the administration of the several Railways :—

Colonel The Hon'ble Sir Andrew Clarke, K.C.M.G., C.B., C.I.E., R.E.	Member of the Governor General's Council in charge of Public Works Department.
The Hon'ble J. Gibbs, C.S.I., C.I.E., C.S. (from 9th June 1880).	
Major-General Alexander Fraser, C.B., R.E.	Secretary to Government of India. Officiated as Hon'ble Member of Council from 2nd March 1880 to 9th June 1880.
Major-General J. S. Trevor, C.S.I., R.E. ...	Director General of Railways and Deputy Secretary to the Government of India. Officiated as Secretary to Government from 2nd March 1880 to 9th June 1880.
G. L. Molesworth, C.I.E., M. INST. C.E. ...	Consulting Engineer to Government of India for State Railways. Officiated as Deputy Secretary from 2nd March 1880 to 9th June 1880.
Colonel W. S. Trevor, V.C., R.E. ...	Attached to Office of Director General of Railways. Since appointed Director General of Railways.

Colonel L. Russell, R.E.	...	Chief Engineer and Joint Secretary to Government of North-Western Provinces and Oudh.
Colonel J. O. Mayne, R.E.	...	Chief Engineer and Secretary, Central Provinces.
Colonel W. S. Trevor, V.C., R.E. W. C. Furnivall, M. INST. C. E. (from 26th October 1880).	...	Chief Engineer and Secretary, Burma.
Colonel F. S. Stanton, R.E.	...	Director of State Railways in Bengal and Secretary to Government of Bengal.
Lieutenant-Colonel R. C. B. Pemberton, R.E. R. T. Mallet, M. INST. C.E. (October 1880)		Director of Stores.
Major A. J. Filgate, R.E.	...	Officiating Accountant General and Officiating Deputy Secretary to Government of India.
Captain F. Firebrace, R.E.	...	Under Secretary to Government of India, Railway Branch.
Colonel J. Shaw-Stewart, R.E.	...	Consulting Engineer for Railways and Joint Secretary to Government, Madras.
Colonel H. F. Hancock, R.E.	...	Consulting Engineer for Railways and Joint Secretary to Government, Bombay.
Major G. W. Oldham, R.E. (officiated during Colonel Hancock's absence).		Deputy Consulting Engineer for Railways and Under Secretary to Government, Bombay.
Colonel F. S. Taylor, R.E. Lieutenant-Colonel R. deBourbel, R.E. (from September 1880).	...	Consulting Engineer to Government of India for Guaranteed Railways, Calcutta.
Colonel J. G. Medley, R.E.	...	Consulting Engineer to Government of India for Guaranteed Railways, Lahore.
Lieutenant-Colonel R. C. B. Pemberton, R.E.		Consulting Engineer to Government of India for Guaranteed Railways, Lucknow.

APPENDIX B.

Contract between the Secretary of State in Council and the East Indian Railway Company as to the maintenance, management, and working of the undertaking by the East Indian Railway Company, dated 22nd December 1879.

This Indenture made the 22nd day of December 1879 between the Secretary of State in Council of India of the one part and the East Indian Railway Company incorporated by an Act of Parliament passed in the session of the 12th and 13th years of the reign of Her present Majesty intituled "an Act for incorporating the East Indian Railway Company and for other purposes connected therewith" of the other part.

Preamble.

Whereas by the East Indian Railway Company Purchase Act 1879 hereinafter called the "Act of 1879" the parties hereto are authorized and empowered to enter into contracts for the purposes hereinafter expressed.

Now this Indenture witnesseth and it is hereby agreed and declared as follows—

Interpretation of terms.

1. In this contract—

"Secretary of State," the expression "the Secretary of State" means the Secretary of State in Council of India—

"the Company," the expression "the Company" means the East Indian Railway Company—

"the East Indian Railway," the expression "the East Indian Railway" means the Railways and works of whatever description forming the undertaking of the Company on the 31st of December 1879—

"the undertaking." the expression "the undertaking" means the East Indian Railway or such part thereof as shall on the 1st of January 1880 be handed over to the Company for the purposes of this contract together with any improvements, alterations and additions of whatever description that may from time to time be made therein or thereto by or with the sanction of the Secretary of State.

Duration of Contract.

2. This contract shall continue in force for the period of fifty years from the 1st of January 1880 subject to the provisions hereinafter contained for determining the same.

Duration of contract.

As to deferring one-fifth of the Annuity.

3. During the continuance of this contract the payment of one-fifth of the annuity of £1,473,750 mentioned in the Act of 1879 shall be deferred and in lieu thereof interest at the rate of £4 per cent. per annum on the sum of £6,550,000 being the capital sum represented by such one-fifth shall be paid by the Secretary of State to the Company in London by half-yearly payments on the 1st of January and the 1st of July in every year the first of such payments to be made on the 1st of July 1880 in respect of the half-year immediately preceding that date.

Annuity deferred.

Interest on deferred annuity.

As to the Undertaking to be transferred to the Company and matters connected therewith.

4. On the 1st of January 1880 the Secretary of State shall hand over to the Company for the purposes of this contract the East Indian Railway together with the rolling stock plant and machinery belonging thereto subject to the following exceptions—

Railway &c. to be handed over.

(1) The land occupied by the Company in the Sulkeah yard at Howrah now or lately used for the storage of State Railway material which land shall nevertheless be handed over to the Company if and so soon as the Secretary of State shall obtain the use of other sufficient land for the storage of such material.

Land in Sulkeah yard.

(2) The telegraphs and all telegraphic appliances belonging to the East Indian Railway which shall remain vested in the Secretary of State subject as hereinafter provided.

Telegraph to remain State property.

5. On the 1st of January 1880 or so soon thereafter as may be the Secretary of State shall deliver to the Company and the Company shall accept for the purposes of the undertaking all stores belonging to the East Indian Railway that may be in hand or in course of delivery on the first of January 1880 except such as on the representation of the Company to be made in writing on or before the 31st day of December 1879 the Secretary of State may adjudge to be unserviceable or surplus stores.

Stores to be handed over.

6. During the continuance of this contract the Secretary of State shall provide and allow the Company to use such telegraphs and telegraphic appliances as the Company shall with the sanction of the Secretary of State from time to time require for the purposes of the undertaking and shall maintain the said telegraphs and telegraphic appliances in good repair and good working condition. The working of the said telegraphs shall be exclusively in the hands of the Company but the Company if so directed by the Secretary of State shall observe the rules for the time being in force in the case of State Railway telegraphs or such of the said rules as the Secretary of State may from time to time prescribe for their observance and the Company shall furnish the Secretary of State with such free passes as he may require for persons employed by him in or about the erection maintenance or inspection of the said telegraphs and telegraphic appliances or otherwise in connection therewith.

Use and maintenance of telegraph.

Free passes for telegraph employés.

7. A separate agreement shall be made between the Secretary of State and the Company as to the working of the Serampore and Kurhurballie coal fields which are intended to be part of the undertaking Provided nevertheless that the rent payable to Government in respect of the said coalfields shall not exceed the aggregates of the fixed rents now payable in respect of the same.

Collieries.

8. If the Branch Railway from the Mogul Serai station on the main line of the East Indian Railway to the river Ganges opposite Benares shall be part of the undertaking handed over to the Company on the 1st of January 1880 the Secretary of State may at any time require the Company to retransfer such branch railway to him and the Company shall not claim any compensation in respect of such retransfer.

Benares Branch.

9. As soon as may be after the 1st of January 1880 an inventory of the undertaking and an inventory and valuation of the rolling stock plant and machinery belonging thereto as on the 1st of January 1880 shall be made and signed by or on behalf of the Secretary of State and the Company the valuation being based on the sums outstanding on that day in the capital account of the Company.

Inventory and valuation of undertaking.

As to the Maintenance and Management of the Undertaking.

10. The Company shall keep the undertaking in good repair in good working condition and fully supplied with rolling stock plant and machinery to the satisfaction of the Secretary of State. If the Company shall fail for the space of one calendar month to comply with any requirement in writing of the Secretary of State in regard to the matters aforesaid or any of them the Secretary of State may enter on the undertaking and execute all such works and provide all such rolling stock plant and machinery as may in his opinion be required for the purposes of the undertaking.

To keep undertaking in good working condition.

In case of non-compliance Secretary of State may enter and execute works.

11. The Company shall keep the rolling stock plant and machinery belonging to the undertaking in good repair and in good working condition to the satisfaction of the Secretary of State.

Rolling stock and machinery.

12. The Company shall maintain a sufficient staff for the purposes of the undertaking to the satisfaction of the Secretary of State.

Sufficient staff to be maintained.

13. The Secretary of State may from time to time by notice in writing require the Company to carry out any alteration or improvement in the undertaking or any addition thereto that

Alteration or improvement.

may in his opinion be necessary for the safety of passengers or for the safety of the public or for the effectual working of the undertaking. Such notice shall specify the alteration improvement or addition required and shall also in general terms describe the works to be executed for the purpose of carrying out such alteration improvement or addition. On receiving any such notice the Company shall with all reasonable speed commence and proceed to execute the works described therein the Secretary of State supplying the necessary funds and providing any land that may be required for the purpose. If in any case the Company shall neglect to proceed with the proposed works or fail to complete the same to the satisfaction of the Secretary of State the Secretary of State may enter on the undertaking and execute the said works.

Supply of funds and land.

14. The Secretary of State shall provide and maintain for the purposes of the undertaking such a force of police as the Company with the approval of the Secretary of State shall from time to time require with this qualification that in case of difference between the Secretary of State and the Company as to the force required for the preservation of law and order the determination of the question shall rest with the Secretary of State. The cost of providing and maintaining the force of police required for the purposes of the undertaking shall be defrayed in the following manner that is to say three-tenths shall be borne by the Secretary of State and the remaining seven-tenths shall be treated as part of the working expenses of the undertaking.

Police.

Cost of providing and maintaining police force.

As to the Use and Working of the Undertaking and the Conveyance of Traffic.

15. The Company shall cause to be run so many trains at such times at such rates of speed between such places and with such conveniences and accommodations as the Secretary of State shall from time to time require.

Trains.

16. The Company shall charge such rates and fares for the carriage of goods and passengers as may from time to time be fixed by the Company with the approval of the Secretary of State Provided that the Secretary of State may require the charges for the conveyance of any mineral or mineral substance or any article of agricultural produce over distances not less than 300 miles to be reduced to any rate not below one-sixth of a pie per maund per mile for full wagon loads and may also require the fare of passengers conveyed in closed carriages with seats to be reduced to any rate not below two pies per mile.

Rates and fares.

17. The Secretary of State may from time to time require the Company to carry out any alteration or improvement in the working of the undertaking that may in his opinion be necessary for the safety of passengers or for the safety of the public or for the effectual working of the undertaking.

Alteration or improvement in working.

18. All services which the Secretary of State may require the Company to perform for the Post Office the Military Department the Police Department or any other Department of the State or for high Government officials (including in such services the conveyance of mails as defined by the Post Office Act or Acts for the time being in force in India the conveyance of Post Office servants when on duty the conveyance of troops and sailors military and naval establishments horses and other animals used for military purposes guns military stores and equipments the conveyance of police prisoners and paupers the conveyance of telegraph stores instruments officers and workmen and of any public stores whatever) shall be performed by the Company on the same general conditions as may for the time being be in force on State Railways and at such rates as may be approved by the Secretary of State not being less than the highest rates in force for the time being for similar services on State Railways of the same gauge.

Conveyance of Government servants and stores.

19. The Company shall convey gold and silver bullion and coin and copper coin belonging to the Government of India and the persons in charge thereof at special rates to be from time to time approved by the Secretary of State.

Special rates for coin and bullion.

20. The Company shall from time to time upon the requisition of the Secretary of State give precedence to the demands of the Government whether for freight or passenger accommodation over all ordinary traffic.

Government demands to have precedence.

21. All stores intended to be used for the purposes of the undertaking shall be conveyed by the Company at rates to be approved by the Secretary of State not being less than the actual cost of conveyance.

Rates for conveyance of stores for the undertaking.

As to Receipts Payments and Expenditure.

22. All monies which shall be received by or on account of the Company in India in respect of the undertaking or from the use and working of the telegraphs and telegraphic appliances provided for the Company under this contract shall at such times and in such manner as the Secretary of State may from time to time direct be paid without deduction into the Treasury of the Government of India at Calcutta to a separate account.

Receipts to be paid into Treasury at Calcutta.

23. All monies required by the Company for the purposes of the undertaking shall be supplied to the Company by the Secretary of State according to such arrangements as shall from time to time be made between the Secretary of State and the Company.

Supply of funds.

24. All monies expended by the Company on account of the undertaking and all other expenses of the Company in connection therewith shall from time to time be stated and submitted to the Secretary of State for his sanction and as between the Company and the Secretary of State shall be allowed only so far as the same shall from time to time have been sanctioned by the Secretary of State.

Statements of expenditure to be submitted for sanction.

As to Accounts.

25. The Company shall keep all such accounts relating to the undertaking and all such accounts as between the Company and the Secretary of State as the Secretary of State shall from time to time require. Such accounts shall be kept in such form and under such heads or divisions and with such details as the Secretary of State shall from time to time prescribe. The said accounts so far as the same are kept in India shall be kept in rupees of the Government of India and so far as they are kept in England shall be kept in sterling money. Such of the said accounts as are kept in England shall from time to time be transmitted by the Secretary of State to the Government of India at Calcutta and there incorporated in the accounts of the Company in India each account for the purpose of such incorporation being converted into rupees at the rate fixed for the adjustment of financial transactions between the Government of the United Kingdom and the Government of India and in use on the day to which such account shall have been made up.

Accounts to be kept in forms prescribed by Secretary of State.

English accounts to be transmitted to India. Rate of exchange.

26. Unless and until otherwise directed the Company shall keep the following accounts—

Accounts to be kept.

A Revenue Account.
A Capital Advance Account.
A Capital Account.
A Stores Account.

27. The Revenue Account shall contain an account of all receipts and payments on account of revenue, and shall be made up half-yearly to the 30th of June and the 31st of December in each year or to such other days as the Secretary of State shall from time to time prescribe. The Revenue Account shall be regularly submitted by the Company to the Secretary of State who may audit the same concurrently with or after expenditure or in both ways as he may think fit and may in case of any error being discovered therein correct the same within three calendar months after the account containing such error shall have been submitted to him. Every Revenue Account shall be considered as settled at the expiration of three calendar months after the same shall have been submitted to the Secretary of State but nevertheless any error which may subsequently be discovered therein shall be corrected in the next Revenue Account or in any subsequent Revenue Account or Accounts as the Secretary of State may determine.

Revenue Account.

Adjustment of errors in Revenue Account.

28. All monies advanced by the Secretary of State for the purpose of carrying out works chargeable to capital or for the purchase of stores or for the payment off of debentures or debenture stock of the Company shall be entered in the Capital Advance Account and interest at the rate of 4½ per cent. per annum or such other rate as shall from time to time be agreed upon by the Secretary of State and the Company shall from time to time be payable to the Secretary of State on the balance of such account not passed to the Capital Account or to the Stores Account.

Capital Advance Account.

29. All monies which the Secretary of State shall pay to the Company in respect of the interest of the Company in the value of the buildings workshops fixtures machinery and plant on the said Kurhurballie and Serampore coalfields and all monies which shall be actually expended

Capital Account.

by the Company or by the Secretary of State upon works rolling stock plant or machinery the cost of which is chargeable to capital and the value of all land provided by the Secretary of State after the 1st of January 1880 for the purposes of the undertaking shall be entered in the Capital Account which shall be made up and stated afresh as often as occasion shall require. Interest at the rate of 4½ per cent. per annum or such other rate as shall from time to time be agreed upon by the Secretary of State and the Company shall from time to time be payable to the Secretary of State on the balance from time to time standing at the debit of the Capital Account.

Account of Stores taken over.

30. The Company shall on or before the 30th of June 1880 make up and deliver to the Secretary of State an account of all stores delivered to the Company as on the 1st of January 1880 and of the value of such stores the value being taken as entered in the books of the Company on the 31st of December 1879 except in those cases if any in which a different value shall be agreed upon by the Secretary of State and the Company. As soon as possible after the 30th of June and the 31st of December in each year or such other half-yearly days as the Secretary of State may from time to time prescribe for the making up of the Revenue Account the Company shall make up and deliver to the Secretary of State an account of all stores in hand on the half-yearly day immediately preceding the making up of the account and of all stores used by the Company for the purposes of the undertaking since the 1st of January 1880 or since the date to which the Stores Account was last made up as the case may be showing the purposes for which such stores have been used. As often as any of the stores in hand shall be used by the Company for the purposes of the undertaking the value of the stores so used as entered in the books of the Company shall be charged to the Revenue Account or to the Capital Account as the case may require in accordance with the provisions in that behalf herein contained. Interest at the rate of 4½ per cent. per annum or such other rate as shall from time to time be agreed upon by the Secretary of State and the Company shall from time to time be payable to the Secretary of State on the value of stores in hand.

Revenue Account made up half-yearly.

Account of Stores used and in hand.

Stores used to be charged off.

Revaluation of stores. Deterioration to be charged to revenue account.

31. The stores in hand shall from time to time be revalued at such time or times as the Secretary of State shall direct and in such manner as shall from time to time be agreed upon by the Secretary of State and the Company and the value of the stores in hand as entered in the books of the Company shall be corrected in accordance with such revaluation. Any deterioration or loss that may be ascertained or discovered upon any revaluation shall be charged to Revenue Account.

Incidence of charge.

32. The question whether any expenditure incurred for the purposes of the undertaking is to be treated in the whole or in part as a charge incurred on Capital Account or how the same is to be dealt with shall be determined on the general principle that capital is to bear the cost of new works of additional rolling stock plant and machinery and of substantial improvements of and additions to old works rolling stock plant and machinery including the cost of any temporary new work the construction of which is requisite for the construction of a work properly chargeable to Capital and that the cost of repairs restorations renewals replacements or substitutions is to be borne by Revenue. Provided nevertheless that any item of expenditure properly chargeable to Capital in accordance with this principle but not exceeding 2,000 rupees may at the discretion of the Secretary of State be charged to Revenue but so that the aggregate expenditure charged to Revenue on account of such items shall not exceed 25,000 rupees in any half-year and provided also that except with the sanction of the Secretary of State no portion of the salaries or allowances of any of the Company's permanent supervising staff shall be chargeable to Capital although for the time being employed partly or wholly in directing or superintending work so chargeable and that no expenses connected with the engagement or passage from or to England of any person in the Company's service shall be chargeable to Capital unless such person shall have been specially engaged to carry out work chargeable to Capital and actually employed upon such work.

Minor works may be charged to Revenue.

No portion of salaries of permanent staff to be charged to capital.

Disagreement as to incidence of expenditure to be settled.

33. If any difference shall arise between the Secretary of State and the Company as to the incidence of expenditure between Capital and Revenue in any particular case the matter in difference shall be referred to the decision of the Joint Auditor if the Secretary of State and the Company shall have appointed such an officer but in case a Joint Auditor shall not have been appointed then the matter in difference shall be referred for final decision to the Company's Auditor or some other person to be named by the Company and a Government Examiner of Railway Accounts or some other person to be named by the Secretary of State or in case of their being unable to agree to a referee to be

named by them. The costs of any such reference shall unless the Secretary of State shall otherwise direct be treated as part of the working expenses of the undertaking.

As to the Working Expenses and the application of the Receipts of the Undertaking.

34. The working expenses of the undertaking shall be paid out of the gross receipts of the undertaking (including in such receipts all monies received by the Company for the use and working of the telegraphs and telegraphic appliances provided for the Company under this contract) and shall so far as possible be borne by the gross receipts of the half-year to which such working expenses are properly attributable.

Working expenses to be paid out of gross receipts.

35. Working expenses shall include all costs and expenses incurred by the Company with the sanction of the Secretary of State in or about the maintenance management and working of the undertaking and all other sums if any proper to be allowed out of Revenue in connection with the maintenance management or working of the undertaking or in connection with the conduct of the affairs of the Company and which shall be sanctioned by the Secretary of State.

Working expenses.

In the working expenses of the undertaking there shall be reckoned—

(1) Such sum or sums of money as shall from time to time be agreed upon between the Secretary of State and the Company as proper to be allowed in respect of the rent of the Company's Office in London office expenses Director's fees and salaries of clerks and servants.

London Office expenses.

(2) So much of the cost of providing and maintaining a police force for the purposes of the undertaking as is not hereby agreed to be borne by the Secretary of State.

Police.

(3) All expenditure incurred by the Company with the sanction of the Secretary of State or by the Secretary of State in keeping the undertaking in good repair and in good working condition and fully supplied with rolling stock plant and machinery except such part if any of such expenditure as may be charged to Capital.

Maintenance.

(4) All expenditure incurred by the Company with the sanction of the Secretary of State in keeping the rolling stock plant and machinery belonging to the undertaking in good repair and in good working condition.

Maintenance of rolling stock and machinery.

(5) All expenditure incurred by the Company with the sanction of the Secretary of State or by the Secretary of State in the execution of any works chargeable to Revenue.

Works chargeable to Revenue.

(6) Such a sum not exceeding Rs. 50,000 in any half-year as may be required by the Secretary of State to cover the costs and charges of and incidental to the supervision and control of the Company by the Secretary of State.

Charges of State control.

(7) The charges of the Government Telegraph Department for rent maintenance and inspection of the telegraphs and telegraphic appliances provided for the use of the Company.

Telegraph charges.

(8) All such other expenses as the Secretary of State and the Company agree to treat as part of the working expenses of the undertaking.

Other agreed expenses.

36. The receipts of the undertaking in each half-year after deducting working expenses and all other charges to Revenue Account properly attributable to that half-year shall be applied in the following manner and in the following order:—

Application of receipts.

(1) In payment of interest upon the debenture stock of the Company in existence on the 1st of January 1880, and upon the debentures of the Company outstanding on that day.

Interest on debenture stock.

(2) In payment to the Secretary of State of so much of the annuity of £1,473,750 as is not deferred under this contract.

Annuity not deferred.

(3) In payment to the Secretary of State of interest at the rate of 4 per cent. per annum on the capital sum represented by the portion of the annuity deferred under this contract.

Interest in lieu of annuity deferred.

(4) In payment of interest payable to the Secretary of State on money standing to the debit of the Capital Advance Account and the Capital Account.

Interest on Capital and Capital Advance Account.

(5) In payment of interest payable to the Secretary of State on the value of stores in hand.

Interest on value of stores in hand.

(6) In payment of such sum as shall from time to time be payable to the Provident Institution in connection with the undertaking.

Payments to Provident Institution.

(7) And the surplus if any shall be applied in manner following that is to say four-fifths thereof shall belong to the Secretary of State on behalf of the Government of India and one-fifth thereof shall belong to the Company and shall as soon as ascertained be forthwith paid over to the Company at Calcutta for distribution among the persons entitled thereto under the Act of 1879.

Application of surplus.

If in any half-year the net receipts of the undertaking shall not be sufficient to answer the purposes coming before the division of the surplus the deficiency with interest at the rate of 4½ per cent. per annum shall be a charge upon the surplus net receipts of subsequent half-years and may be retained by the Secretary of State out of the surplus net receipts of any subsequent half-year before division of profits between the Secretary of State and the Company.

Deficit to be made up from surplus receipts of subsequent half-years.

As to Running Powers and other Facilities and Accommodation for other Railway Companies and State Railways and the Secretary of State.

37. The Secretary of State may from time to time require the Company to allow the use of the railways forming part of the undertaking for the passage of engines and trains belonging to other Railway Companies or to State Railways upon the payment of reasonable tolls and under reasonable conditions and restrictions.

Running powers.

38. The Secretary of State may from time to time require the Company to supply other Railway Companies or State Railways with any of the rolling stock of the undertaking which shall not for the time being be required for the purposes thereof upon reasonable terms and conditions.

Supply of stock to other Railways.

39. The Secretary of State may from time to time require the Company to execute work in their workshops in respect of rolling stock and machinery belonging to State Railways at such reasonable prices and upon such terms as shall be agreed upon between the Secretary of State and the Company but so nevertheless as not to impede or unduly interfere with the ordinary operations of the Company as carried on therein.

Execution of State Railway work in shops.

40. The Secretary of State may from time to time require the Company to land at Howrah or Calcutta railway stores belonging to the Secretary of State. The Company shall be paid for such services at such reasonable rates as shall from time to time be provided by the Secretary of State.

Landing State Railway stores at Howrah or Calcutta.

41. The Secretary of State may from time to time require the Company to make reasonable arrangements for the interchange of traffic and rolling stock with railways belonging to other Companies or to the State.

Interchange of traffic and rolling stock.

42. The Secretary of State may from time to time require the Company to allow the use of any of the stations forming part of the undertaking for the accommodation of the traffic of any other Railway Company or State Railway upon the payment of reasonable tolls and under reasonable conditions and restrictions and may also require the Company to make such alterations and additions as may in the opinion of the Secretary of State be necessary or convenient for the purposes of such accommodation upon such terms as may be agreed upon between the Secretary of State and the Company.

Joint use of stations.

43. The Secretary of State may at any time require the Company to make such alterations and additions in or to the sections of the railways comprised in the undertaking situate respectively between the following points that is to say between Delhi and Ghaziabad and between Agra and Toondla as will admit of metre gauge stock of the Rajputana State Railway running upon such sections respectively upon such terms as may be agreed upon between the Secretary of State and the Company.

Running of metre gauge stock over certain sections of line.

44. If the Chairman or Deputy Chairman of the Board of Directors of the Company shall certify to the Secretary of State by writing under his hand that he considers any requirement by the Secretary of State purporting to be made under this part of the contract not to be reasonable upon any ground to be stated by him in writing and if there shall then be a difference of opinion between the Secretary of State and the Company as to the reasonableness of

Referee to decide difference.

the requirement in question or as to the propriety of any modification or alteration therein the matter in difference shall be referred for decision to an officer of the Government to be named by the Secretary of State and to an officer of the Company to be named by them or if such officers are unable to agree then to some person to be appointed by them.

Cost of reference may be treated as working expenses.

If the matter in difference shall be determined adversely to the Secretary of State or if any modification or alteration in the requirement of the Secretary of State shall be recommended or in any event if the Secretary of State shall so direct the costs of the reference shall be treated as part of the working expenses of the undertaking.

As to the Construction and Working of Auxiliary or Branch Railways.

Auxiliary or Branch Railways.

45. The Secretary of State may require the Company to construct any auxiliary or branch railway of the same gauge in connection with any railway forming part of the undertaking and to work any auxiliary or branch railway of the same gauge in connection with any railway forming part of the undertaking whether constructed by the Company or not either as agents of the Secretary of State or as part of the undertaking, as the Secretary of State may determine upon such terms and conditions as may in each case be agreed upon between the Secretary of State and the Company.

The Company to comply with the requirements of the Secretary of State.

Company to comply with requirements of Secretary of State.

46. The Company shall with all reasonable speed comply with all such requirements as the Secretary of State shall from time to time make in accordance with this contract.

As to the Supervision and Control of the Secretary of State and the Appointment of a Government Director.

Supervision and control.

47. In all matters relating to the undertaking and not herein specially provided for the Company shall be subject to the supervision and Control of the Secretary of State.

Government Auditor or controlling officer.

48. For the purpose of inspecting the undertaking and auditing the accounts of the Company or otherwise exercising such supervision and control as are intended to be reserved to the Secretary of State by the contract the Secretary of State may from time to time appoint such person or persons as he may think proper with such powers as he may consider necessary or expedient and the Company shall afford every person so appointed all reasonable facilities for the purpose of enabling him to perform the duties entrusted to him by the Secretary of State.

Free access to all documents.

49. The Company shall record and keep in proper books full and particular accounts of all their transactions and proceedings including full and true minutes of all their meetings meetings of Directors communications with India and correspondence so as at all times to exhibit fully and truly the state of their affairs and the Secretary of State or any person or persons appointed by him in that behalf shall at all reasonable times have free access to all the books accounts papers and documents of the Company relating to the undertaking with power to call for or make copies of or extracts from the same.

Government Director of the Company.

50. The Secretary of State may from time to time appoint any one person to be a Director of the Company. The Government Director shall be *ex officio* a member of all Committees appointed by the Board of Directors of the Company or by the Company in relation to the undertaking or any matter connected therewith and he may moreover exercise at his discretion an absolute right of veto in all proceedings whatever at the Board of Directors. The Government Director shall not be removable except by the Secretary of State. The Secretary of State may from time to time, as often as occasion shall require appoint a person to represent the Government Director at any meeting of the Board or at any Committee meeting at which the Government Director may not be present and the person so appointed shall have all such rights, and may exercise all such powers as the Government Director if present would have had or might have exercised.

Miscellaneous Provisions.

Company to abstain from other business.

51. The Company shall not during the continuance of this contract without the sanction of the Secretary of State in writing first obtained engage in or carry on any business other than the business which is the subject of this contract.

52. The Company shall not during the continuance of this contract without the sanction of the Secretary of State in writing first obtained acquire any property in India. If the Company shall in contravention of this clause acquire any property such property shall not be disposed of by the Company without the sanction in writing of the Secretary of State and the Secretary of State may at any time during the continuance of this contract or within one calendar month after the determination thereof purchase such property from the Company at the price actually paid by the Company for the same and if the purchase money for such property shall be paid to the Company during the continuance of the contract the expenditure shall be carried to Capital Account.

Company not to acquire property without sanction.

53. If in the opinion of the Secretary of State any land in the possession of the Company is not required for the purposes of the undertaking the Secretary of State shall certify such opinion to the Company. Upon receipt of such certificate or so soon thereafter as may be the Company shall state in writing whether they acquiesce in the opinion of the Secretary of State or whether they object thereto and if so the grounds of their objection. If no objection is stated by the Company or if the grounds of their objection if any are not in the opinion of the Secretary of State sufficient the land in question shall upon the requisition of the Secretary of State be restored to him and thereupon the value of such land if entered in the Capital Account shall be written off such account.

Land in possession of the Company not required.

54. The Company shall from time to time make such returns and furnish such statistics in such form and under such heads and divisions and with such details as the Secretary of State may from time to time require. The costs of preparing such returns and statistics and incidental thereto shall be treated as part of the working expenses of the undertaking.

Returns and statistics.

55. The Secretary of State shall promote the passing by the Legislature in India of any Act or Acts which may be required to enable the Company to carry into effect this contract.

Act to give effect to this contract.

56. No claim shall be made upon the Secretary of State by the Company for compensation in respect of any Act of the Indian Legislature of general applicability which may prejudicially affect the undertaking or the profits thereof.

No claim for prejudicial effect to undertaking due to legislation.

57. The Company may if they think it expedient and shall if required by the Secretary of State maintain and manage a Provident Institution and a Savings Bank for the benefit of the servants of the Company upon such terms and under such rules and regulations as shall from time to time be approved by the Secretary of State.

Provident Institution.
Savings Bank.

58. Any notice direction appointment certificate of opinion approval or sanction to be given or signified on the part of the Secretary of State for any of the purposes of this contract shall be sufficient and binding if in writing signed by the Secretary of State or one of his Under-Secretaries or by a Secretary of Government at Calcutta or by any other officer or servant duly authorized to act on behalf of the Secretary of State in respect of the matters to which the same shall relate and the Secretary of State shall not in any case be bound in respect of the matters aforesaid unless by some writing signed in the manner before mentioned.

Signature of Secretary sufficient.

59. The Company shall at all times during the continuance of this contract keep an office established at Calcutta and shall keep at the said office an authorized Agent or Committee of Agency with whom the Secretary of State and the Government of India or other officer or officers deputed in that behalf may communicate on affairs concerning the undertaking and all drafts drawn and receipts given by the said Agent or Committee of Agency or under his or their authority on behalf of the Company concerning the undertaking and the affairs thereof shall be binding on the Company and every notice to be given to the Company (save any notice with respect to the determination of this contract as hereinafter provided) shall be sufficiently given if left at the said office or personally served on the said Agent or any member of the said Committee of Agency.

Agent at Calcutta.

As to the Determination of the Contract.

60. The Secretary of State or the Company may determine this Contract at the end of the 20th or at the end of any succeeding 5th year (computed from the 1st of January 1881) of the said term of fifty years on giving two clear years' notice in writing to the other party hereto of his or their intention so to do and thereupon on the 31st day of December on which the

Determination of Contract.

aforesaid notice shall expire the Company shall give the Secretary of State possession of the undertaking together with the rolling stock plant and machinery belonging thereto and all stores in hand or in course of delivery on that day and all plans books surveys sections printings writings and documents whatsoever in anywise connected with the undertaking and all other property if any belonging or appertaining thereto. And the Secretary of State shall be bound to indemnify the Company their property and effects against all such debts and liabilities if any as they may have incurred with the sanction of the Secretary of State and which shall be then subsisting and thereupon this Contract shall determine without prejudice to the rights of either party against the other in respect of any covenant herein contained which may have been previously broken.

Arbitration.

Arbitration.

61. If the Secretary of State and the Company shall fail to agree touching any matter with respect to which their agreement is required by this contract or if in any case not herein specially provided for any dispute question or controversy shall at any time arise between the Secretary of State and the Company touching these presents or any clause or thing therein contained or the construction hereof or any matter connected with these presents or the operation hereof or the rights duties or liabilities of either party in relation to the premises then and in every such case the matter as to which the Secretary of State and the Company shall fail to agree or the matter in difference as the case may be shall be referred to two arbitrators or their umpire pursuant to and so as with regard to the mode and consequences of the references and in all other respects to conform to the provisions in that behalf contained in the Common Law Procedure Act 1854 or any subsisting statutory modification thereof and upon every such reference the arbitrators and umpire shall respectively have power to examine witnesses upon oath or affirmation and either to fix settle and determine the amount of costs of the reference and award respectively or incidental thereto to be paid by both parties or by either party or to direct the same to be taxed either as between solicitor and client or otherwise and to direct and award where and by and to whom such costs shall be paid and every or any such reference may be made a rule of Her Majesty's High Court of Justice or of the High Court of Judicature at Fort William in Bengal on the application of the Secretary of State or of the Company and either the Secretary of State or the Company may instruct Counsel to consent thereto for the other party.

In Witness whereof Sir Barrow Helbert Ellis Knight Commander of the Most Exalted Order of the Star of India and Sir Frederick James Halliday Knight Commander of the Most Honorable Order of the Bath being two Members of Council of India have hereunto set their hands and seals and the said Railway Company have hereunto caused their Common Seal to be affixed the day and year first above written.

Signed sealed and delivered by the above named Sir Barrow Helbert Ellis and Sir Frederick James Halliday being two Members of the Council of India in the presence of

ROBERT WICKENDEN
Clerk to the Legal Adviser India Office.

B. H. ELLIS. Seal.

FRED. JAS. HALLIDAY. Seal.

The Common Seal of the East Indian Railway Company was hereunto affixed in the presence of

R. M. STEPHENSON.
T. D. FORSYTH.

Seal of the E. I. Railway Company.

APPENDIX C.

Text of Agreement with Bengal Central Railway Company.

The following is the text in full of the agreement made between the Secretary of State and the Bengal Central Railway Company :—

This Indenture made the twenty-sixth day of July one thousand eight hundred and eighty-one between the Secretary of State in Council of India of the one part and the Bengal Central Railway Company Limited of the other part Witnesseth that it is hereby agreed and declared as follows—

1. In this contract—

Interpretation of terms.

the expression "Secretary of State" means the Secretary of State in Council of India,

the expression "the Company" means the Company party to these presents.

2. It shall be lawful for the Secretary of State to select and determine the route and direction of a line of railway to commence at or near Calcutta and to proceed by way of Baraset Bongong and Jessore within the limits of the surveys and plans in the next succeeding section referred to to a locality at or near Kulna and also to select and determine the route and direction of a line of railway to commence at or near the Ranaghat station of the Eastern Bengal Railway and to proceed to a point at or near Bongong and at such point to form a junction with the line of railway first mentioned in this section. Sufficient terminal accommodation shall be constructed by the Company in Calcutta or provided by the Secretary of State as he may decide. The Secretary of State shall give notice to the Company of the route and direction of each line selected by him and of any part or parts thereof respectively when so selected. The Secretary of State shall have power to determine the situation and extent of the aforesaid junction and of all stations station yards offices warehouses conveniences and works to be constructed in connexion with or as part of the said lines of railway respectively.

Selection of lines &c.

3. Inasmuch as the Government of India has caused various surveys and plans to be made and works to be executed with the view of facilitating and expediting the construction of lines of railway to proceed respectively from Calcutta or its neighbourhood by way of Baraset Bongong and Jessore to or near to Kulna and from the Ranaghat station of the Eastern Bengal Railway or some point near that station to or near to Bongong the Company shall within three months after the Government of India shall have signified in writing to the Company the amount (in rupees) of money expended by Government in and about such surveys and plans and works pay the amount so signified into the Treasury at Calcutta for the purposes of the Government of India, and the amount so paid shall when certified by the Government of India be deemed expenditure properly incurred by the Company relative to the construction and completion of the said lines of railway.

Repayment of certain costs incurred by the Government of India.

The Company shall have the benefit of the surveys, plans and works referred to in this section.

4. The Secretary of State shall after the selection of the route and direction of the said lines of railway to be constructed by the Company (hereinafter called 'the said lines') or of any part or parts thereof respectively provide free of cost to the Company the land which shall be required for the said lines and junction or for the part or parts so selected and for the works connected therewith and for proper stations station yards offices warehouses conveniences and works and for any junctions that the company may at any time with the sanction of the Secretary of State make between the said lines and any other railway and shall give to the Company possession of the land so provided. All land of which possession shall be so given which shall not be permanently required for the purposes of the Company shall as soon as practicable be restored and delivered up by the Company to the Government of India.

Land.

5. The Company shall on receiving possession of land provided under the last preceding section proceed with diligence in the construction thereon of the said lines and of all such stations station yards offices warehouses machinery conveniences and works as shall be necessary or expedient as well with reference to the original construction of the lines and the working thereof as with reference to their permanence and protection from injury by inundation or other cause whatsoever. The railways constructed by the Company shall be five feet six

Works.

inches in gauge and of a general structural character in conformity with the now established standard of railways in India of that gauge.

Opening of the lines for traffic.

6. The Company may from time to time as often as an inspecting officer acting on behalf of the Secretary of State shall certify that any portion of the said lines or either of them is fit for conveyance of passengers and goods open the same portion for public traffic.

And the Company shall open the said lines respectively for public traffic throughout and supply them with a good and sufficient stock of engines carriages wagons plant and machinery for working the same when and so soon as such an inspecting officer as aforesaid shall have certified that the said lines are complete and fit for the conveyance of passengers and goods throughout.

Lease of land to Company.

7. Upon both of the said lines being completed and opened for public traffic throughout the Secretary of State will at his own expense and free of all expense or cost to the Company whether by way of rent or otherwise grant to the Company a lease of or otherwise secure to the Company a right and title to the land which shall have been provided under section 4 (or so much of such land as shall be permanently required for the purposes of the Company) for a term of ninety-nine years from the first day of January one thousand eight hundred and eighty-two subject to the same being sooner determined under the provisions in that behalf hereinafter contained and the Secretary of State shall guarantee to the Company the right to and possession of such land as against any claimant but shall not be called upon to show any title thereto.

As to maintenance of the undertaking and Government inspections.

8. The Company shall keep the said lines (or so much thereof respectively as shall for the time being have been opened for traffic) and all the stations station yards offices warehouses conveniences and works thereto belonging in good repair and sufficiently supplied with engines carriages rolling stock plant and machinery and shall keep the whole in good working condition.

The whole shall at all times be open to inspection by any officer or officers acting on behalf of the Secretary of State and the Company shall afford to every inspecting officer all such facilities as may be reasonably requisite to enable him to perform his duties. The Company shall forthwith execute all such works as the Secretary of State shall by notice in writing require the Company to execute for the purpose of keeping the said lines in good repair and in good working condition. The Company shall also from time to time provide sufficient working capital for the service of the said lines.

9. After the said lines shall be opened for traffic throughout the Secretary of State may from time to time by notice in writing require the Company to carry out at their own cost any reasonable alteration or improvement in or addition to the said lines or in or to any stations station yards offices warehouses conveniences or works therewith connected respectively which may be necessary for the safety of passengers or of the public. Such notice shall specify the alteration addition or improvement required and shall also in general terms describe the works to be executed for the purpose of carrying out such alteration addition or improvement. On receiving any such notice the Company shall with all reasonable speed execute the works described therein the Secretary of State providing (free of cost and on terms similar to those on which land is to be provided under section 4) any land that may be required for the purpose and granting to the Company a lease of such land to run concurrently with and for the like term as the lease in section 7 mentioned and upon the same terms. If in any case the Company shall fail to execute and complete the works to the satisfaction of the Secretary of State and within a reasonable time the Secretary of State may execute the works or the portion thereof unexecuted by the Company and (for that purpose) may from time to time enter upon any land or premises of the Company and the Company shall on demand pay into the Treasury at Calcutta for the purposes of the Government of India the money expended by him in executing such works and if such moneys shall not be paid on demand the same shall carry interest as against the Company at the rate of four per cent. per annum to be computed from the time of demand for payment of such moneys until payment of the same. The Secretary of State may at any time apply any moneys payable by him to the Company under any of the provisions of these presents in or towards the satisfaction of any principal moneys or interest due to him by the Company under the section and when section 27 shall have ceased to operate such principal moneys and interest shall be a first charge on the net earnings of the Company from time to time accruing.

10. The Secretary of State may from time to time prohibit the Company from using any engine carriage wagon vehicle boat machine or appliance of any kind whatsoever the use of which shall be declared by a duly authorised inspecting officer to be attended with danger to passengers or the public and the Secretary of State may by taking possession of such engine carriage wagon vehicle boat machine or appliance or by such other means as he shall think fit to employ prevent the Company from using the same.

11. The Company shall unless hindered or prevented by accident or any other matter beyond their own control cause at least one train daily to be run from either extremity of each of the said lines which shall for the time being have been opened for traffic to the other extremity of the same line.

As to working the undertaking and conveyance of traffic.

12. The rates and fares to be charged by the Company for the carriage of passengers and goods respectively shall not be in excess of the following maxima (that is to say)—

Passenger Fares.		*Goods Rates.*	
1st class	12 pies per mile.	1st class	$\frac{1}{3}$ of a pie per maund per mile.
2nd ,,	6 ,, ,,	2nd ,,	$\frac{2}{3}$ of a pie ,, ,,
3rd ,,	$4\frac{1}{2}$,, ,,	3rd ,,	1 pie per maund per mile.
4th ,,	3 ,, ,,		

The classification of goods shall be arranged by the Company subject to the approval of the Secretary of State.

13. The Company will at all times convey free of charge on the said lines of railway respectively and any part thereof which for the time being shall have been opened for traffic the Government mails and post office bags and the guards and other servants of the post office in charge thereof and also (when they are on duty) all officers and persons in the administration of the post office. The Company will at all times also convey all troops and sailors in Her Majesty's service and all other persons to whom the provisions of the Acts and Regulations for the time being in force for Her Majesty's Naval and for Her Majesty's European and Indian Forces respectively shall be applicable and all police officers engineers artisans and other persons when employed in the business of the Government at rates calculated as follows *i.e.* all commissioned officers in Her Majesty's Naval and Military Services and persons in a similar station in life shall be entitled to travel in first class carriages at second class fares. European troops sailors and artisans and Europeans in Her Majesty's Indian Army (under the rank of commissioned officers) shall be entitled to travel in second class carriages at the lowest fares. And all other such persons aforesaid including prisoners and paupers at the lowest fares. For every one hundred men conveyed at the lowest fares two tons of luggage will be conveyed free of charge and persons entitled to travel first class will be allowed the ordinary amount of luggage taken by a first class passenger free of charge. The company will also at all times when and as required by Government convey all Military and Naval establishments not hereinbefore specified all horses and other animals used for military purposes guns military stores and equipments and all public stores of what kind soever at the lowest rates for the time being ordinarily chargeable by the Company for the carriage of such animals goods and stores respectively. The several privileges of conveyance and carriage hereby stipulated for shall at all times be enjoyed in preference to and with priority over the public use of the said lines.

14. The Company shall convey gold and silver bullion and coin and copper coin belonging to Government and the persons in charge thereof at special rates to be from time to time agreed upon between the Secretary of State and the Company.

15. The Secretary of State shall be at liberty to construct maintain use and work as his own property such electric telegraphs and telegraphic appliances as he shall think fit along the said lines or any part or parts thereof and it shall be lawful for him for such purposes to enter at all reasonable times by his agents workmen or others on the said lines or any part of them and to erect maintain make do and execute thereon all such buildings machinery works acts and things as the Secretary of State shall consider necessary or proper in relation to the construction maintenance use and working of the said telegraphs and telegraphic appliances. The Secretary of State shall not in respect to such matters or any of them be subject to the control or interference of the Company. All buildings machinery works and appliances erected or brought by or on behalf of the Secretary of State on the said lines or either of them shall be and remain the property of the Secretary of State.

Telegraphs.

The Company shall at all times furnish the Secretary of State with such free passes as may be required for persons employed by him in or about or in anywise in connexion with the erection maintenance working or inspection of the said telegraphs and telegraphic appliances.

16. The Secretary of State shall construct or provide such electric telegraphs and telegraphic appliances as the Company shall with the sanction of the Secretary of State from time to time require for the purposes of working the said lines and the Secretary of State will allow the Company to have the exclusive use (so long as they shall work the said lines) of such telegraphs and telegraphic appliances and will maintain the same in good repair and in good working condition.

The working of such telegraphs and telegraphic appliances shall be exclusively in the hands of the Company and at their cost but the Company if so directed by the Secretary of State will observe the rules for the time being in force in the case of State Railway telegraphs or such of the said rules as the Secretary of State may from time to time prescribe for their observance. And the Company will pay the charges of the Government Telegraph Department for rent maintenance and inspection of the telegraphs and telegraphic appliances provided under this section for their use.

Police.

17. The Secretary of State shall provide and maintain for the purposes of the said lines such a force of police as the Company with the approval of the Secretary of State shall from time to time require: Provided that in case of difference between the Secretary of State and the Company as to the portion of the force required for the preservation of law and order the determination of the question shall rest with the Secretary of State. The cost of providing and maintaining the whole force of police employed for the purposes of the said lines shall be defrayed as follows (that is to say) three-tenths thereof shall be borne by the Secretary of State and the remaining seven-tenths shall be borne by the Company.

Application of Indian Railway Acts.

18. The Company and its lines of railway and undertaking shall be subject to the provisions of the "Indian Railway Act 1879" and to all other Acts of the Indian Legislature in force for the time being in the province of Bengal.

Money capital.

19. The Company shall pay into the Bank of England to the account of the Secretary of State the sum of one million pounds by such instalments and at such times as the Secretary of State and the Company shall agree to be requisite to ensure the due prosecution and Completion of the said lines with the aforesaid junction and all stations station yards offices warehouses machinery conveyances and works necessary or expedient in connexion therewith and to ensure the said lines being adequately supplied with engines carriages rolling stock plant and machinery and being duly opened for the conveyance of passengers and goods throughout.

Drafts on capital.

20. As often as any money shall be required by the Company for purposes to which the same is properly applicable under these presents the same may be drawn by the Company in London in such sums as shall from time to time be shown to the satisfaction of the Secretary of State to be necessary and according to such arrangements as shall be made from time to time with the Secretary of State for the purpose. Ten days' notice of every draft or proposed draft shall be given to the Secretary of State and the Company shall not in any case be entitled to draw to an extent greater than the balance in its favor for the time being.

Deficiency of money capital.

21. If when the whole of the said sum of one million pounds shall after being paid into the Bank of England to the account of the Secretary of State have been drawn by the Company and expended by it both of the said lines with their stations station yards offices warehouses conveniences and works shall not have been completed in all respects in conformity with the provisions of these presents and adequately provided with engines carriages rolling stock plant and machinery and with sufficient working capital the Company shall with the sanction of the Secretary of State provide the money necessary to defray the further expenditure requisite to enable the Company fully to carry out and give effect to the provisions of these presents and such money shall be paid by the Company into the Bank of England to the account of the Secretary of State and the moneys so paid as last aforesaid may be drawn by the Company in the same manner as nearly as may be as if they had formed part of the aforesaid sum of one million pounds.

Payment of interest to Company.

22. The Secretary of State will until both the said lines are completed and opened for traffic throughout or until the thirtieth day of June one thousand eight hundred and eighty-six (inclusive of such day) whichever shall first happen pay to the Company in London out of the revenues of India half-yearly on every first day of July and first day of January interest at the rate of four pounds per cent. per annum on all or any such sums or sum not in the whole exceeding one million two hundred and fifty thousand pounds as shall for the time being have been paid by the Company into the Bank of England to the credit of the Secretary of State under the provisions contained in sections 19 and 21 the interest on each individual sum to commence from the time when the same shall have been paid into the Bank of England. If the liability of the Secretary of State to pay interest to the company shall terminate by the completion and opening for traffic of both the said lines the Secretary of State shall as soon as may be pay to the Company any interest due calculated up to the date of such termination and a duly apportioned amount of the net earnings of the Company realised in respect of the half-year current at the date of the termination of the liability of the Secretary of State under this

section to pay interest shall be applied by the Company towards the repayment in London to the Secretary of State of the apportioned interest paid by him.

As to interest on interest paid by Secretary of State and repayment of interest.

23. On all moneys paid as interest by the Secretary of State until repaid to him under the provisions in that behalf hereinafter contained he shall be entitled to simple interest at the rate of four pounds per cent. per annum accruing de die in diem and calculated on the same moneys respectively from the respective dates of the payment thereof to the Company until repayment but such moneys or any interest thereon shall not be repayable to the Secretary of State except so far as he shall become entitled to receive the same under the provisions hereinafter contained : Provided nevertheless that the Secretary of State shall not be entitled to interest on any such part of any half-yearly payment of interest made by him to the Company as shall be ultimately repaid to him out or by means of the net earnings (hereinafter defined) of the Company attributable to the half-year in respect of which the same half-yearly payment of interest shall have been made.

Net earnings and working expenses.

24. All moneys received by or on account of the Company in India in respect of the working of the said lines or either of them or any part or parts thereof which shall for the time being have been opened for traffic and all income (not being interest paid by the Secretary of State to the Company under section 22 hereof) in any wise received by the Company in respect of the undertaking which shall be carried on by them under the provisions of these presents (which said moneys and income are hereinafter collectively termed gross earnings of the Company) shall in the first place be applicable in payment of the working expenses (as hereinafter defined) of the Company in such manner that the working expenses of every half-year shall as far as possible be borne by the gross earnings of the half-year to which such working expenses are properly attributable and the residue remaining from time to time at the end of each half-year after deducting all unpaid working expenses incurred up to the end of such half-year shall be deemed the net earnings of the Company for that half-year and shall be dealt with accordingly.

25. The term 'working expenses of the Company' shall mean and include all costs and expenses incurred by the Company in and about the maintenance management and working of the said lines with all stations station yards offices warehouses conveniences junctions and works rolling stock plant and machinery thereto belonging or therewith or therein used and in and about the working of any electric telegraphs and telegraphic appliances provided under section 16 and in general all reasonable expenses of managing and carrying on the undertaking of the company.

In the working expenses there shall be reckoned and included so much of the cost of providing and maintaining a police force for the purposes of the said lines as is not hereby agreed to be borne by the Secretary of State the charges of the Government Telegraph Department for rent maintenance and inspection of the telegraphs and telegraphic appliances provided for the use of the Company and any other expenditure (whether in the nature of a payment towards a sinking or reserve fund or otherwise) which the Secretary of State and the Company may from time to time agree to treat as working expenses. But no part of the cost of the original construction of the said lines or of any of the stations station yards offices warehouses conveniences and works or of any additions to the same or either of them or of the purchase (except by way of replacement or renewal) of any of the engines carriages rolling stock plant or machinery belonging to or used with or on or provided for the said lines shall be included in the working expenses of the Company.

26. The Company shall from and after the opening for traffic of the said lines or of any part or parts thereof respectively keep a revenue account in which shall be entered all the gross earnings of the Company and the working expenses of the Company. The revenue account shall be made up half-yearly to the thirtieth day of June and the thirty-first day of December in every year or to such other days as the Secretary of State shall from time to time prescribe.

Temporary provisions.

27. So long as the Secretary of State shall be liable to pay any interest to the Company under section 22 and after the termination of such liability so long as the interest paid by him to the Company and the interest on such portions thereof as under the provisions hereinbefore contained shall carry interest shall not have been respectively fully repaid and paid to him or so long as any moneys (whether for principal or interest) are due by the Company under section 9 to the Secretary of State the following subsections respectively lettered (*a*) (*b*) and (*c*) shall apply and be in force—

(*a*) All moneys received by or on account of the Company in India in respect of the working of the said lines or either of them or any part or parts thereof which for the time being shall have been opened for traffic shall at such times and in such manner as the Secretary of State may from time to time direct be paid without deduction into the Treasury of the Government of India at Calcutta to a separate

account and such moneys may be drawn upon by the Company whether for expenditure in India or remittance to England according to such arrangements as shall from time to time be made with the Secretary of State for application to any purposes to which such moneys are by these presents applicable.

(*b*) The net earnings of the Company in or in respect of each half-year shall be applied by the Company for the purposes and in the order following (that is to say)—

(1) To repay to the Secretary of State as far as may be the interest paid by him to the Company in respect of the same half-year.

(2) To pay to the Company in London two pounds ten shillings per cent. on the total amount of the moneys paid by the Company into the Bank of England conformably with the provisions of these presents.

(3) As to one-half of any residue remaining after making the payments hereinbefore in this subsection specified or such part thereof less than a half as shall be sufficient for the purpose to pay therout as far as may be to the Secretary of State in London—

Firstly any interest due to him under the provisions of section 23 and

Secondly any moneys which the Secretary of State shall have paid to the Company as interest under section 22 and which shall not then already have been repaid to him.

And as to the other half of such residue or other the ultimate remainder of the said net earnings to pay the same to the Company for its own use.

Provided nevertheless and it is hereby declared that notwithstanding anything hereinbefore contained the Company shall be entitled to have their net earnings which shall be realised in each separate entire calendar year computed from the time when both the aforesaid lines shall have been completed and opened for traffic applied in making payment to them in full of the two half-yearly amounts of two pounds ten shillings per cent. on the total amount of the moneys paid by the Company into the Bank of the England conformably with the provisions of these presents attributable to the same calendar year in priority to the application thereof to any other of the aforesaid purposes mentioned in this subsection and in dealing with the net earnings of the Company regard shall be had to this declaration and no part of any net earnings realised in the first half of any calendar year computed as aforesaid shall be applied otherwise than in or towards satisfaction to the Company of two pounds ten shillings per cent. on the said total amount until after the expiration of the second half of the same calendar year.

(*c*) The revenue account shall be regularly submitted by the Company to the Secretary of State who may audit the same (the Company giving every facility and assistance required for such audit) concurrently with or after expenditure or in both ways as he may think fit and may in case of error being discovered therein correct the same within three calendar months after the account containing such error shall have been submitted to him. Every revenue account shall be considered as settled at the expiration of three calendar months after the same shall have been submitted to the Secretary of State but nevertheless any error which may (whether subsequently or not) be discovered therein shall be corrected in the next revenue account or in any subsequent revenue account or accounts as the Secretary of State may determine any reasonable expenses of and incidental to every audit on behalf of the Secretary of State (including the expenses incurred by the employment by the Secretary of State of any person for any purpose connected therewith) shall be paid by the Company and shall form part of the working expenses of the Company and the statement by the Secretary of State of the amount of such expenses shall be conclusive.

28. When and as the liability of the Secretary of State under the provisions hereinbefore contained to pay interest to the Company shall have terminated and all interest paid by him to the Company and the interest which shall accrue on such portions thereof as shall carry interest and all moneys due to the Secretary of State under section 9 shall have been respectively fully repaid and paid to him any moneys paid into the Treasury at Calcutta by the Company under subsection (*a*) of section 27 and not already drawn out by the Company or otherwise dealt with conformably with these presents shall belong absolutely to the Company and shall forthwith be paid over to them by the Secretary of State.

Capital expenditure and accounts.

29. All the expenditure of the Company during or relative to the original construction and completion of the said lines with the aforesaid junction and the said stations station yards offices warehouses conveniences junctions and works respectively and relative to the cost of originally supplying the requisite engines carriages rolling stock plant and machinery and any boats required for working any ferry shall from time to time be stated by the Company and submitted

to the Secretary of State and as between the Company and the Secretary of State such expenditure shall be allowed so far only as the same shall from time to time be admitted by him.

30. The question whether any expenditure incurred by the Company is to be treated in the whole or in part as a charge incurred on capital account or how the same is to be dealt with shall be determined on the general principle that capital is to bear the cost of new works of additional rolling stock plant and machinery and of substantial improvements of and additions to old works rolling stock plant and machinery (including the cost of any temporary new work the construction of which is requisite for the construction of a work properly chargeable to capital) and that the cost of repairs restorations renewals or replacements falls under the head of working expenses and is not a charge incurred on capital account : Provided that the expenses of maintenance or repair necessitated by causes other than fair or ordinary wear and tear if incurred within twelve months after the opening for traffic shall be borne by capital. After the said lines have been open for traffic throughout no portion of the salaries or allowances of any of the Company's permanent supervising or other administrative staff shall be chargeable to capital although for the time being employed partly or wholly in directing or superintending work so chargeable and no expenses connected with the engagement or passage from or to England of any person in the Company's service shall be chargeable to capital unless such persons shall have been specially engaged to carry out work chargeable to Capital and been actually employed upon such work but until the lines are opened for traffic throughout all the expenses of the Company (including all cost of and incidental to the formation and registration of the Company) shall be chargeable to capital except to the extent to which there may in any half-year be earnings of the Company applicable to meet the expenses of such half-year.

31. If any difference shall arise between the Secretary of State and the Company as to whether any expenditure incurred in any particular case is to be treated as a charge incurred on capital account the matter in difference shall be referred to the decision of the joint Auditor if the Secretary of State and the Company shall have appointed such an officer but in case a joint Auditor shall not have been appointed then the matter in difference shall be referred for final decision to the Company's Auditor (or some other person to be named by the Company) and a Government Examiner of Railway Accounts (or some other person to be named by the Secretary of State) or in case of their being unable to agree to a referee to be named by them. The cost of any such reference shall unless the Secretary of State shall otherwise direct be treated as part of the working expenses of the Company.

32. The Company shall enter all the expenditure allowed under section 29 in an account to be called "the capital account" and when and so soon as the said lines with the aforesaid junction and all proper stations station yards offices warehouses conveniencss and works shall have been completed and provided with the necessary engines carriages rolling stock plant and machinery the Secretary of State shall by examination of such account ascertain and certify the amount of the expenditure. If any further expenditure shall from time to time be made by the Company or if any payment shall be made by the Company to reimburse the Secretary of State for moneys expended by him under section 9 and if the Secretary of State shall admit that such expenditure or payment is properly chargeable to capital the same shall in like manner be entered in the capital account. And from time to time as occasion shall require the said capital account shall be made up and stated afresh and the total amount of expenditure entered therein shall be ascertained and certified by the Secretary of State. In the said capital account shall also be entered any moneys produced by sale of property originally purchased under expenditure entered in the said capital account under section 29 or this present section and the Secretary of State shall from time to time as may be necessary ascertain and certify the amount of the excess of the expenditure entered in the capital account over the receipts entered therein.

Rate of exchange.

33. If for the settlement of any transaction arising between the Secretary of State and the Company it become necessary to decide at what rate of exchange any sums shall be converted from Indian currency into sterling money the rate to be adopted shall be the average rate at which bills shall have been drawn by the Secretary of State on the Treasury of the Government of India at Calcutta in the half-year or half-years in which the transactions may have occurred.

Accounts and returns of traffic.

34. The Company shall keep all such accounts and returns of its traffic as are required by the Government to be kept by the Indian Railway Companies whose undertakings are worked under the supervision of the Secretary of State and in the forms in which the same accounts and returns of traffic are required to be kept by such Companies and the Company shall at its own cost render all accounts and returns of traffic required to be kept by it under this section to the Secretary of State at such times as he shall from time to time require.

Return of surplus.

35. If it shall happen that when the said lines have been completed and open for traffic throughout with the aforesaid junction and all proper stations station yards offices warehouses conveniences junctions and works and furnished with sufficient engines carriages rolling stock plant and machinery the Company shall not have drawn out the whole of the

moneys paid by it into the Bank of England to the credit of the Secretary of State pursuant to these presents the balance of such moneys remaining undrawn shall be refunded to the Company in London : Provided always that it shall be lawful for the Secretary of State to deduct therefrom any sum then payable by the Company to him under the provisions of section 9 of these presents.

Running powers over other systems and interchange of traffic.

36. The Secretary of State will upon such terms as may from time to time be agreed upon between him and the Company endeavour to obtain for the Company powers to form such junctions as the Secretary of State may approve with railways belonging to the other Companies or to the State and powers to run the trains of the Company on such other railways upon reasonable terms and conditions and in particular the Secretary of State will endeavour to obtain such powers for the Company with reference to the railways of the Eastern Bengal Railway Company and of the Calcutta Municipal and Port Commissioners respectively in such manner as the Secretary of State may think necessary in order to ensure to the Company Convenient access to a suitable terminal station at Calcutta and to the warehouses and wharves on the Hooghly.

37. The Company will from time to time upon the requisition of the Secretary of State make reasonable arrangements for the use of the said lines for the passage of engines and trains belonging to other Railway Companies or to State Railways for the interchange of traffic and rolling stock belonging to other Companies or the State and for the use of any of the stations of the Company situated on the said lines for the accommodation of the traffic of any other Railway Company or State Railway : Provided that all such arrangements shall be made subject to the payment of reasonable tolls and under reasonable conditions and restrictions.

Miscellaneous provisions.

38. The Secretary of State will promote the passing by the Legislature in India of any Act or Acts which may be required to enable the Company to fulfil the obligations hereby undertaken by it.

39. Every notice direction requisition appointment approval or certificate to be given or signified on the part of the Secretary of State for any of the purposes of these presents shall be sufficient and binding if in writing signed by the Secretary of State or one of his Under Secretaries or his Assistant Under Secretary or by a Secretary to Government at Calcutta or by any other officer or servant duly authorised to act on behalf of the Secretary of State or the Government of India in respect of the matters to which the same shall relate and the Secretary of State shall not in any case be bound in respect of any of the matters mentioned in this section unless the matter shall be duly stated in writing and signed.

40. The Company shall at all times keep an office established at alcutta and shall keep at such office an authorised agent or committee of agency with whom the Secretary of State the Government of India or any officer or officers properly deputed in that behalf may communicate on affairs concerning the Railway Company. All drafts drawn and receipts given by the said agent or committee of agency or under his or their authority on behalf of the Company concerning the Railways of the Company and the affairs thereof shall be binding on the Company and every notice to be given to the Company other than the notices mentioned in any of the several sections hereinafter contained shall be sufficiently given if left at the office mentioned in this section or if personally served on the said agent or on any member of the said committee of agency.

Lapse to Government by efflux of time.

41. At the end of the term of ninety-nine years (on the thirty-first day of December one thousand nine hundred and eighty) the land which shall have been provided for the Company under these presents so far as the same shall not have been previously restored and delivered up by the Company shall with the said lines and all buildings works and fixed machinery thereon not then already belonging to the Secretary of State revert to the Secretary of State free from all debits and charges whatsoever. The Company shall thereupon deliver to the Secretary of State all plans surveys sections books printings writings drawings and documents whatsoever in anywise connected with the said lines and the affairs thereof and the Company shall sell and the Secretary of State shall purchase all engines carriages rolling stock plant and machinery stores and boats which at the end of the said term of ninety-nine years shall be the property of the Company and used in working the said lines or in connection therewith for such sum of money as shall be the fair value thereof the same to be determined in case of dispute by arbitration in manner by section 45 provided in respect of the matters therein dealt with and such sum of money with interest thereon at the rate of five pounds per cent. per annum calculated from the expiration of the said term of ninety-nine years until payment shall be paid by the Secretary of State out of the revenues of India to the Company in London within four calendar months after the amount thereof shall have been determined.

Purchase by the Secretary of State.

42. It shall be lawful for the Secretary of State to purchase the said lines with the stations station yards offices warehouses works conveniences engines carriages rolling stock plant machinery stores and boats thereto belonging either upon the first day of January one thousand

nine hundred and twelve or upon the first day of January one thousand nine hundred and thirty-two upon giving one year's previous notice in writing to the Company in London of his intention to purchase and in case such notice of purchase shall be given the land provided for the Company under these presents so far as the same shall not have been previously restored and delivered up with the lines and all buildings works and machinery thereon (not then already belonging to the Secretary of State) and all engines carriages rolling stock plant machinery stores and boats used in working the said lines or in connection therewith or appropriated thereto shall on the first day of January one thousand nine hundred and twelve or on the first day of January one thousand nine hundred and thirty-two (according as the notice of purchase shall have been given for the one of those dates or for the other) become the absolute property of the Secretary of State free from all debts and charges whatsoever and the Company shall thereupon deliver to the Secretary of State all the engines carriages rolling stock plant machinery stores and boats used upon or in connection with or appropriated to the said lines and all plans surveys sections printings writings drawings and documents whatsoever in anywise relating thereto.

The Secretary of State shall on the day on which the said lines and other the premises mentioned in this section shall under this section become his property pay to the Company in London out of the revenues of India the amount of the expenditure entered in the capital account and certified by the Secretary of State (if no receipts shall have been entered in the capital account) or (in case any receipts shall have been entered therein) then the ultimate certified excess of such expenditure as last aforesaid over such receipts as last aforesaid together with in either case such bonus as hereinafter provided (that is to say) in the former of the said two cases a bonus at the rate of twenty-five pounds per cent. upon the total expenditure entered in the capital account and so certified as aforesaid and in the latter of the same two cases a bonus at the like rate upon the largest certified excess which there shall at any previous time have been of the expenditure entered in the capital account over the receipts which shall up to the same previous time have been entered therein and together with in either of the said two cases a bonus at the rate of twenty-five pounds per cent. on the maximum amount which shall at any time have been agreed to by the Secretary of State as the amount of working capital of the Company appropriated to its undertaking contemplated by these presents and together also with the value (to be ascertained by arbitration in case of difference) of any stores delivered up to the Secretary of State under this section provided that the Secretary of State shall not under this section become liable to pay a larger amount to the Company in respect of bonuses than three hundred and twelve thousand five hundred pounds or to pay to the Company a larger aggregate amount than one million eight hundred and twelve thousand five hundred pounds and such aggregate amount shall be subject to deductions as hereinafter provided (that is to say) the Secretary of State shall deduct therefrom the sum (to be ascertained by arbitration in case of difference) requisite to place the said lines in fair working condition and to render their equipment with engines carriages rolling stock plant machinery and boats reasonably adequate both in quality and quantity to the amounts charged in the capital account for such equipment.

Provision for default of Company in constructing and working the railways.

43. If default shall be made by the Company in raising or paying the said sum of one million pounds or any of the instalments thereof or such further capital as shall be required for the construction and completion of the said lines or in the due application of any moneys drawn by the Company out of the moneys paid into the Bank of England to the account of the Secretary of State or in the execution and completion of the said lines and works hereby provided to be executed and completed or in case of any breach on the part of the Company of any of the provisions herein contained it shall be lawful for the Secretary of State to give to the Company in London six calendar months notice in writing of his intention to terminate the interest of the Company in the said lines and works and the land provided for the same and unless the default or breach shall be made good or remedied prior to the expiration of the said six calendar months it shall be lawful for the Secretary of State on the expiration of the same six calendar months to assume possession of the said lines works and of the engines carriages rolling stock plant machinery stores and boats belonging or appropriated to the said lines free from all debts and charges whatsoever. And in case of such possession being assumed the Secretary of State shall be liable to pay out of the revenues of India to the Company in London within six calendar months from so assuming possession the amount of the expenditure of the company entered in the capital account and certified by the Secretary of State (if no receipts shall have been entered in the capital account) or (if any receipts shall then have been entered therein) the ultimate certified excess of such expenditure as last aforesaid over such receipts as last aforesaid together with the value (to be ascertained by arbitration in case of difference of any stores of which the Secretary of State shall have assumed possession under this section and together also with so much (if any) of the moneys paid by the Company into the Bank of England to the account of the Secretary of State pursuant to these presents as shall then not have been drawn out by the Company : Provided that from the amount becoming payable by the Secretary of State under this section shall be deducted by the Secretary of State in case the powers of this present section shall be exercised subsequently to the opening of the said lines for traffic the sum (to be ascertained by arbitration in case of difference) requisite to restore the said lines to a fair working condition and render their equipment with engines carriages rolling stock plant machinery and boats reasonably adequate both in quality and quantity to the amounts charged in the capital account for such equipment.

44. Upon the Secretary of State acquiring the right of possession of the said lines and the interest of the Company in the same terminating under any of the three sections last hereinbefore contained the obligations of the parties hereto under any of the provisions of these presents save provisions in such three sections contained shall cease. But this shall not exempt either party from liability for previous breaches of provisions in these presents contained or deprive the Secretary of State of the right to recover from the Company any moneys which the Company shall be under liability to pay to him or from applying in or towards satisfaction of any such moneys as last aforesaid any moneys becoming payable by him to the Company under any of the three sections last hereinbefore contained.

Extinguishment of liability.

45. If the Secretary of State and the company shall fail to agree touching any matter with respect to which their agreement is required by these presents or if (in any case not hereinbefore specially provided for) any dispute question or controversy shall at any time arise between the Secretary of State and the Company touching these presents or the construction or operation hereof or the rights duties or liabilities of either party in relation to the premises then and in every such case the matter as to which the Secretary of State and the Company shall fail to agree or the matter in difference as the case may be shall be referred to two arbitrators or their umpire pursuant to and so as with regard to the mode and consequences of the reference and all other respects to conform to the provisions in that behalf contained in the Common Law Procedure Act 1854 or any subsisting statutory modification thereof and upon every such reference the arbitrators and umpire shall respectively have power to examine witnesses upon oath or affirmation and either to fix settle and determine the amount of cost of the reference and award respectively or incidental thereto to be paid by both parties or by either party or to direct the same to be taxed either as between solicitor and client or otherwise and to direct and award where and by and to whom such costs shall be paid and every or any such reference may be made a rule of Her Majesty's High Court of Justice or of the High Court of Judicature at Fort William in Bengal on the application of the Secretary of State or of the Company and either the Secretary of State or the Company may instruct counsel to consent thereto for the other party.

Arbitration.

In witness, &c.

APPENDIX D.

RAILWAY CONFERENCE.

The following extracts from the recorded proceedings and from Government Resolutions passed in connection with the objects of the Railway Conferences of 1879 and 1880 give detailed information of the business that was transacted by the two Conferences :—

Proceedings of the Railway Conference held at Calcutta in February 1879.

OBSERVATIONS.—The Conference of Railway Delegates assembled at Calcutta on the 10th February in accordance with Government of India Resolution Nos. 375-99, dated 20th January 1879, and held six meetings.

2. The primary object of the Conference was to lay down rules for the interchange of rolling stock between all connected railways.

Twenty-two rules were framed and passed, and a Resolution was recorded to the effect that these rules, with approval of the several Boards of Directors, should come into force on the 1st September next.

3. The Conference also had under consideration the want of a revised set of general rules and regulations for all Indian railways, and the following resolutions were passed :—

i)—In the opinion of this Conference, a revised set of general rules and regulations for all Indian railways should be compiled and published under section 14 of the new draft Act, or under the corresponding section of the Act as passed.

(ii)—That Government be asked to appoint an officer to compile the rules and regulations, and that the Agent of each Company be requested to decide, on behalf of his own Company, on the adoption or modification of such rules.

(iii)—That the Agents of the several Companies be invited to send in to the Secretary of the Railway Conference any new rules or regulations they would like added to those now in force on their lines, and also any corrections or alterations they wished to have made in the existing rules.

4. The question of establishing Provident Funds for railway employés was discussed, and it was suggested that certain proposals submitted by the Agents of the Bombay, Baroda and Central India and Madras Railways be referred to the various Boards of Directors and the Government of India, with a view to ascertain if they would be prepared to contribute such a fund out of working expenses, and if so, to what extent.

5. The Hon'ble Sir Andrew Clarke brought before the Conference the subject of technical and industrial education for the children of railway employés, and said that he would be glad to learn the views of the Agents on the establishment of a large Central Technical and Industrial School in the hills for the elder children of railway employés. The State to build the school, the annual maintenance to be paid by the parents, and by a grant-in-aid, per pupil attending, from the revenue of the several lines. Schools to be constructed to accommodate at least 800 boys or 800 girls, as the expense per head for smaller numbers would be, in Sir Andrew Clarke's opinion, almost prohibitory. The Agents stated that they would, after communication with their London Boards, address Government on this matter.

6. Sir Andrew Clarke introduced for discussion the draft Railway Bill, which was read clause by clause, and various suggestions and alterations were noted for the consideration of the Select Committee to which the Bill had been referred.

RESOLUTION.—The Government of India learn with satisfaction that a practical set of rules for the interchange of rolling stock have been passed by the Conference.

2. The Resolutions touching on the compilation of a revised set of general rules and regulations are approved. Copies of the existing rules and regulations, and also the corrections

and alterations which are desired by the railway authorities, should be submitted to the Government of India at an early date.

3. The question of instituting Provident Funds should be taken into consideration.

4. Attention should be invited to paragraphs 34, 35 and 36 of the Conference Minutes on the subject of establishing a Central Technical and Industrial School for the children of railway employés; on this point Government will await the communications promised by the Agents of the Railway Companies.

5. The thanks of the Government of India should be conveyed to the Railway Delegates for the care and attention they have bestowed on the subjects brought before them, and for the careful and conciliatory manner in which the intricate question of interchange of rolling stock has been dealt with. The thanks of His Excellency the Governor General in Council are also due to Major-General J. S. Trevor, R.E., the President of the Conference, for his conduct of this special matter of the interchange of rolling stock.

Proceedings of the Conference of Railway Delegates assembled at Calcutta on the 10th of February 1879, in accordance with Government of India, Public Works Department, Resolution No. 375—99 (Railway), dated 20th January 1879.

INTERCHANGE OF ROLLING STOCK BETWEEN ALL CONNECTED BROAD GAUGE RAILWAYS IN INDIA.

No. 1.

1. At a Meeting of the Railway Delegates held at the Public Works Secretariat in Calcutta on the 10th February 1879—

PRESENT:

COLONEL J. S. TREVOR, R.E.			*President.*
G. L. MOLESWORTH, ESQ., Consg. Engr. to Govt. of India, Delegate from State Rys.			*Vice-President.*
BRADFORD LESLIE, ESQ., Agent and Chief Engr.,	„	E. I. Ry. Co.	*Members.*
FRANKLIN PRESTAGE, ESQ., Agent,	„	E. B. Ry. Co.	
COLONEL J. H. JENKINS, B.S.C., Agent,	„	O. & R. Ry. Co.	
D. ROSS, ESQ., Traffic Manager, JABEZ LIGHTFOOT, ESQ., Auditor, (Joint, with one vote,)	„	S., P. & D. Ry. Co.	
F. MATHEW, ESQ., Agent and Chief Engr.,	„	B., B. & C. I. Ry. Co.	
H. CONDER, ESQ., General Traffic Manager,	„	G. I. P. Ry. Co.	
A. M. SAUNDERS, ESQ., Agent and Manager,	„	Madras Ry. Co.	

The following officers also attended the Meeting and joined in the discussion, but did not vote on the questions put to the Meeting:—

N. ST. L. CARTER, ESQ., Traffic Manager, E. I. Ry. Co.
CAPTAIN W. SEDGWICK, R.E., Offg. Manager, P. N. State Railway.
J. CONDER, ESQ., Traffic Manager, I. V. State Railway.
CAPTAIN R. A. SARGEAUNT, R.E., Secy. to the Conference.

2. The following rule, which had been previously proposed and circulated, was read, *viz.*:—

Rule for regulating the mode in which the decisions of the Conference of Railway Delegates are to be arrived at and given effect to.

"It shall not be competent for any representative of a Railway Company to intimate the withdrawal of his Company from any resolution arrived at by the majority of the Conference, but no resolution will be brought in force till three months have elapsed from the date on which it may be passed; and it will be open to the London Board of Directors of any Company within that period to record its dissent, on which such resolution will, as regards their line, be inoperative."

Proposed by Mr. Saunders and seconded by S., P. & D. Ry. Delegate that the three months in the above rule be extended to six months. There being no objection raised to this extension

of time, the proposition was carried. With this modification the rule was agreed to (subject, as far as the Great Indian Peninsula Railway are concerned, to paragraphs 2 and 3 of their Agent's letter No. 1415 of the 30th January 1879, addressed to the Consulting Engineer for Railways, Bombay, being recorded below).

Extract from Great Indian Peninsula Railway Agent's letter No. 1415.

"2. With regard, however, to the rule proposed to be adopted for regulating the mode in which the decisions of the Conference are to be arrived at and given effect to, the circumstances of the English Railway Clearing House are hardly sufficiently similar to form a guide to the rule which should be adopted to provide for alterations in India. Moreover, any Resolution of the Conference would scarcely be in the hands of the Directors in sufficient time to enable them to communicate their opinion upon it within three months.

"3. I am therefore to state that the Agent cannot accept any decision arrived at by the Conference until it has been approved of by the Board of Directors."

3. General rules for interchange of rolling stock were then discussed.

The following rules were agreed to as applicable to all Indian broad gauge railways:—

GENERAL.

RULE I.—The day is to be reckoned as twenty-four hours, commencing at midnight, Madras time to be adopted in all cases. The week to end at midnight on Saturday.

No *dies non* to be allowed under these rules.

RULE II.—All stock to be considered as handed over when entered in the number taker's book at the junction station, and it is to be so entered directly it is put into the lines or sidings in which such stock is usually placed for that purpose.

Calculation of free time and demurrage charges to be reckoned from the first complete hour after delivery, fractions of hours being disregarded.

RULE III.—Passenger carriages, horse boxes, carriage trucks, break vans, and passenger road or luggage vans, are to be, in all cases, reckoned as coaching vehicles, whether they run upon passenger or goods trains. All other kinds of vehicles are to be reckoned as goods vehicles.

RULE IV.—No return vehicle shall be run, whether loaded or empty, unless otherwise mutually arranged, on any other than the exact route to its own line by which it was received, under a penalty of rupees twenty-two per diem from the time it was missent, until it returns to a station on the route by which it was received.

Vehicles may under the above conditions be loaded on their return journey to any station on the route to the owning line or beyond *viâ* the owning line.

RULE V.—So soon as the rolling stock of any railway passes into the custody or possession of any other railway, such other railway is to be responsible for all and every contingency that may arise from the use of such stock while it remains in their possession. Except that if the contingency is clearly traceable to defect of material or workmanship, the actual repair or replacement of the vehicle in which there was such defect, but not of any other vehicle or any other consequent damage, is to be at the expense of the owning railway.

The cost of repairs arising from ordinary wear and tear to be always borne by the owning railway; but cases of palpable damage (such as dropping heavy weights into wagons and so damaging the bottoms, neglect of greasing or oiling, and other similar neglects), and all cases of accidents or collision to be borne by the railway in whose custody or possession the stock may be at the time the damage occurs.

No claim shall be admitted for the cost of repairs of stock unless sent to the railway which is responsible for the payment of it within three months of the time at which the repairs are completed.

RULE VI.—Six additional days to be allowed in case of damage to the stock of either railway on the line of another railway for the repairs of such stock, and no demurrage shall be charged for those six days. But if the damage is such as will require longer than six days to complete the repair, the stock must be returned to the owning railway. If not sent within the six additional days, whether repaired or not, demurrage will be charged after the expiration of the six days unless specially exempted by the Traffic Manager of the owning railway.

Notice to be sent within one month to the owning railway in all cases how and when the damage took place and the nature of it.

COACHING.

RULE VII.—The exchange of passenger stock to be subject in extent to mutual arrangement between the respective railways.

RULE VIII.—The mileage charge on coaching vehicles to be seven pies per mile both on the outwards journey and in returning, except that no mileage is to be charged on the return journey for horse boxes, carriage trucks, hospital carriages, prison vans, and special saloon carriages not used for ordinary traffic unless returning under load.

Double horse boxes while carrying four or more horses to be counted and charged mileage as two vehicles.

RULE IX.—Coaching vehicles to be allowed one hour for every twelve and a half miles run on foreign lines, and twenty-four hours extra at destination, free of demurrage.*

RULE X.—Demurrage to be charged on all coaching vehicles detained beyond the time named in Rules VI and IX at the rate of eight annas per hour.

The Conference adjourned till 11 A.M. on the following day.

No. 2.

4. The Conference re-assembled at 11 A.M. on Tuesday, the 11th February.

PRESENT:

As on the 10th, with the exception that the Eastern Bengal Railway Company was represented by Mr. G. Low Calder, Chief Accountant, instead of by Mr. Prestage.

The proceedings of the previous meeting were read.

5. The discussion of the rules for the interchange of rolling stock was continued.

GOODS.

RULE XI.—The interchange of goods stock to extend to all connected lines and branches, a fair proportion of through traffic being accepted at junctions in time of pressure.

(N.B.—*This rule has been modified in accordance with Resolution under paragraph 25, page 7.*)

RULE XII.—All consignments of less than three tons to be transhipped at junction. In all other respects, the interchange of goods traffic and stock shall be unrestricted.

Traffic Managers to be at liberty to make exceptions by mutual agreement as to the amount to be transhipped in cases of consignments which, from their bulk or weight, fully occupy a wagon, or require exceptional care, such as furniture, glass-ware, stationery, millinery, pictures, musical instruments, &c., &c.

The above two rules were unanimously agreed to.

6. The following rule was then proposed:—

No mileage charge to be made on goods vehicles when running empty, or returning with a load of eighty-one maunds or more to the owning line.

Mr. Molesworth proposed as an amendment that all words after the word "empty" be struck out.

For.	*Against.*
Mr. Molesworth.	Colonel Jenkins.
„ Mathew.	Mr. Leslie.
„ Conder (G. I. P. Ry.).	„ Calder.
„ Saunders.	
The S., P. and D. Ry. Delegate.	

Colonel Trevor did not vote.

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* *Vide* paragraph 8, page 4.

The amendment was carried and the rule passed as under, *viz.* :—

RULE XIII.—No mileage charge to be made on goods vehicles when running empty.

7. The following rule was next proposed :—

* That, subject to the proviso in Rule XIII, mileage be paid to the sending railway for goods vehicles of all descriptions at the rate of one pie per ton or fraction of a ton of goods conveyed in either direction in such vehicles. In respect of every mile a goods vehicle of one railway may carry goods on the line of another railway.

Mileage to be paid on the weight entered in the invoice of charges.

This rule was agreed to by all Members of the Conference except Mr. Conder, Great Indian Peninsula Railway, who proposed a mileage rate of ⅓rd of a pie per ton.

* (*For Rule XIV as finally passed,* vide *page* 8.)

[When read at the following meeting the mileage rate was further discussed, and Mr. Conder (Great Indian Peninsula Railway) suggested that, with the view of obtaining an unanimous proposal, a compromise as to the rate of mileage be made, and that the rate be fixed at half of a pie per ton, and the daily speed at 150 miles. This met with no seconder.]

8. The Conference agreeing that a free allowance of time should be made according to the mileage run on a foreign line or lines, and also that twenty-four hours should be allowed for unloading and the same for re-loading free of demurrage, it was put to the meeting whether the allowance of time should be reckoned both for coaching and goods vehicles by miles per hour or by miles per day.

For miles per hour.	*For miles per day.*
Col. Jenkins.	Mr. Molesworth.
Mr. Leslie.	„ Conder (G. I. P. R.).
„ Mathew.	„ Saunders.
„ Calder.	
The S., P. and D. Ry. Delegate.	

Colonel Trevor did not vote.

Carried, that the reckoning be made at per hour.

9. Mr. Leslie proposed an allowance of seven miles per hour.

For.	*Against.*
Mr. Leslie.	Mr. Molesworth.
Col. Jenkins.	„ Conder (G. I. P. R.).
The S., P. and D. Ry. Delegate.	„ Mathew.
Mr. Calder.	„ Saunders.
Col. Trevor.	

Carried.

10. The opposers of this motion wished the following opinions to be recorded :—

Messrs. Molesworth and Mathew were in favour of a speed of six and a half miles an hour.

onMessrs. Cder (Great Indian Peninsula Railway) and Saunders were of opinion that the speed should be fixed at 140 miles a day.

11. The opinion of the majority being in favour of a speed of seven miles an hour, the following rule was passed, *viz.* :—

* Goods vehicles to be allowed one hour for every seven miles run on a foreign line, and for unloading and re-loading twenty-four hours for each and every operation free of demurrage.

* (*For Rule XV,* vide *page* 8.)

12. Mr. Conder proposed that a free allowance of twelve hours at each junction be granted. This being supported by Mr. Saunders only, was lost.

13. It was then proposed that demurrage should be at the rate of one anna per ton of carrying capacity.

For.	*Against.*
The Sind, Punjab and Delhi Railway Delegate.	Mr. Conder (Great Indian Peninsula Ry.).
Mr. Calder.	„ Molesworth.
„ Leslie.	„ Saunders.
Col. Jenkins.	„ Mathew.
„ Trevor.	

Carried.

14. Mr. Conder, in recording his dissent, stated that, in his opinion, the rate of demurrage should be Rs. 12 a day, or if the hourly rate had to be adopted, it should be annas 8 per hour. With this opinion Mr. Saunders concurred. Messrs. Molesworth and Mathew were in favour of the rate being fixed at annas 8 per hour.

15. The following clause was passed by the majority, *viz.*:—

RULE XVI.—Demurrage to be charged on all goods vehicles detained beyond the time named in Rules VI and XV at the rate of one anna per ton of carrying capacity per hour.

The Conference adjourned till 11 A.M. on the following day.

No. 3.

The Conference re-assembled at 11 A.M. on Wednesday, the 12th February 1879.

16. PRESENT:—As at meeting No. 1.

The proceedings of the previous meeting were read.

17. Proposed by the Sind, Punjab and Delhi Railway Delegate that—

RULE XVII.—The receiving railway may call upon the forwarding railway to accept empty wagons with a view to equalize the ton-mileage.

This rule was agreed to without dissent.

18. Proposed by Mr. Leslie, and seconded by the Sind, Punjab and Delhi Railway Delegate, that—

RULE XVIII.—The railway on which through traffic originates shall provide wagons for such traffic. But when the through traffic offering is more than the wagon stock of the sending railway can cope with, it may call on the receiving railway to place a daily average capacity of wagon stock at its disposal at the junction for traffic to, and *vid*, the receiving railway; and in the event of failure to comply within one week, the sending railway shall be entitled to charge two pies per ton-mile on all traffic to the extent of the wagon stock short supplied, which it may send through in its own stock: Provided that the receiving railway shall not be required to supply more wagons than sufficient to maintain an equal interchange of stock based on the carrying capacity. Open wagons to be accepted if supplied with proper sheets and ropes.

This rule was agreed to by all members of the Conference with the exception of Mr. Conder (Great Indian Peninsula Railway), who did not vote.

19. Proposed—

RULE XIX.—In case any goods vehicles are loaded on the homeward journey to any station short of the junction with the owning railway, the Audit Offices of the respective railways shall make a special return of the same to each other, and the mileage charge under Rule XIV shall be charged to the railway so loading such wagons.

This rule was agreed to without dissent.

20. Proposed by Mr. Conder (Great Indian Peninsula Railway), and seconded by the Sind, Punjab and Delhi Railway Delegate, that—

Whatever amount is paid for mileage, demurrage or penalty for wrong sending by any Company for the use of vehicles of other Companies is, in all cases, to belong, and be paid over to, the owning Company.

Mr. Leslie proposed as an amendment that the word "demurrage" be struck out.

For.	*Against.*
Mr. Leslie.	Mr. Molesworth.
„ Prestage.	„ Conder (Great Indian Peninsula Ry.).
Col. Jenkins.	„ Saunders.
Mr Mathew.	The Sind, Punjab and Delhi Ry. Delegate.
Col. Trevor.	

The amendment was carried, and the rule passed as under :—

RULE XX.—Whatever amount is paid for mileage and penalty for wrong sending by any railway for the use of vehicles of other railways is in all cases to belong to, and be paid over to, the owning railway.

21. The following rule was proposed :—

RULE XXI.—Each railway to accept the statements of other railways with respect to the loads and wagons, unless the number takers at the junction notice and record that the loads have been interfered with, when the actual contents, and their condition, must be ascertained and recorded by a responsible officer of the receiving railway.

This rule was unanimously agreed to.

22. Proposed that—

RULE XXII.—The accounts referring to any mileage, demurrage or penalty for wrong sending, in which any railway is concerned, shall be open to the inspection of such railway.

This rule was passed without dissent.

23. The want of a revised set of rules and regulations for all railways in India was brought by the President before the Conference. Several of the existing rules and regulations were made under Act XVIII of 1854, section 29, and now require revision.

The President suggested that these rules should be printed in the manner adopted on English railways, *i.e.*, such portions as relate to all railways being in a uniform type, and the special rules for each railway, if any, exhibited in a type peculiar to each railway.

Such a compilation, he thought, could best be prepared by an independent officer, in communication with an officer of each Company nominated for the purpose.

Resolved that—In the opinion of this Conference, a revised set of general rules and regulations for all Indian railways should be compiled and published under section 14 of the new draft Act, or under the corresponding section of the Act as passed.

Resolved further that—Government be asked to appoint an officer to compile the rules and regulations, and that the Agent of each Company be requested to decide, on behalf of his own Company, on the adoption or modification of such rules.

Resolved also that—The Agents of the several Companies be invited to send in to the Secretary of the Railway Conference any new rules or regulations they would like added to those now in force on their lines, and also any corrections or alterations they wished to have made in the existing rules.

This was agreed to.

[Mr. Conder (Great Indian Peninsula Railway), not having been aware that this question was to be brought before the Conference, preferred not to express any opinion.]

The Conference adjourned till 3 P.M. on the following day.

No. 4.

24. The Conference re-assembled at 3 P.M. on Thursday, the 13th February.

PRESENT :—As at meeting No. 1, except that Mr. Carter did not attend.

The proceedings of the previous meeting were read.

25. Mr. Saunders proposed that the following be added to Rule XI, *viz.* :—

It shall not be competent for any railway Company to refuse to receive traffic booked through from connected Railways, so as to devote all their resources to traffic booked locally; but a fair proportion of through traffic must be accepted.

Mr. Molesworth proposed as an amendment that the following be added to Rule XI, *viz.* :—

A fair proportion of through traffic being accepted at junctions in times of pressure.

The amendment was carried unanimously.

26. Mr. Conder (Great Indian Peninsula Railway) stated that from what he had heard there was a disposition to re-consider Rules XIV, XV and XVIII, and requested that they might receive further discussion; and, with the consent of the President, he made the three following propositions, which were voted on as a whole :—

(i) That the mileage rate for goods vehicles on foreign lines be fixed at $\frac{3}{4}$rds of a pie per ton or fraction of a ton of goods conveyed.

(ii) That goods vehicles be allowed one hour for every $6\frac{1}{2}$ miles run on a foreign line.

(iii) That in Rule XVIII the rate per ton mile be fixed at double the ordinary mileage rate.

For.	*Against.*
Mr. Conder.	Colonel Jenkins.
,, Prestage.	The Sind, Punjab and Delhi Ry. Delegate.
,, Mathew.	Mr. Leslie.
	,, Saunders.

Colonel Trevor and Mr. Molesworth did not vote.

The motion was lost.

27. After further discussion, Mr. Conder (Great Indian Peninsula Railway) was given to understand that if he would withdraw the third item of his proposals, the Conference would, for the sake of arriving at a general agreement, accept his first two proposals. Mr. Conder (Great Indian Peninsula Railway) wishing to meet the general views of the Conference, and agreeing that a unanimous proposal on this much vexed and important question was desirable, withdrew his third item accordingly, and the following was put to the Conference :—

(i) That the mileage rate for goods vehicles on foreign lines be fixed at $\frac{3}{4}$rds of a pie per ton or fraction of a ton of goods conveyed.

(ii) That goods vehicles be allowed one hour for every $6\frac{1}{2}$ miles run on a foreign line.

Carried without dissent.

The following rules were then passed :—

RULE XIV.—That, subject to the provisos in Rules XIII and XVIII, mileage be paid to the sending railway for goods vehicles of all descriptions at the rate of $\frac{3}{4}$rds of a pie per ton or fraction of a ton of goods conveyed in either direction in such vehicles, in respect of every mile a goods vehicle of one railway may carry goods on the line of another railway.

RULE XV.—Goods vehicles to be allowed one hour for every $6\frac{1}{2}$ miles run on a foreign line, and twenty-four hours for unloading and twenty-four hours for re-loading at destination, and twelve hours at intermediate stations for each of these operations free of demurrage.

28. It was decided that the rules should be printed consecutively.

The Conference adjourned till 11 A.M. on Saturday, the 15th February.

No. 5.

29. The Conference re-assembled at 11 A.M. on Saturday, the 15th February.

PRESENT :—As at meeting No. 1, except that the following were absent—Mr. Molesworth, Captain Sedgwick, and Messrs. Carter and J. Conder.

30. The minutes of meetings were read from commencement, and some additions and verbal alterations made, which were embodied in the proceedings.

31. The rules for the interchange of rolling stock as settled from time to time by the Conference having been separately printed,* were read and confirmed.

32. It was resolved that these rules, subject to the approval of the several Boards of Directors, come into force on the 1st September 1879. It being arranged that any notices which may have been given to terminate existing agreements be considered as expiring on the 31st August 1879.

33. Mr. Saunders brought forward for discussion the question of establishing Provident Funds for railway employés. It was decided that this should be taken up at a subsequent meeting.

34. The President, at the desire of Sir Andrew Clarke, handed to the Delegates copies of the rules for free passes on State Railways. He also stated that Sir Andrew Clarke trusted that all Companies would endeavour to encourage the education of the children of all railway employés, and grant them free conveyance to and from school. The Agents present promised that the matter should continue to receive consideration.

35. Sir Andrew Clarke (through the President) said that he would be glad to learn the views of the Agents on the establishment of a large Central Technical and Industrial school in the hills for the elder children of railway employés. The State to build the school; the annual maintenance to be paid by the parents, and by a grant-in-aid, per pupil attending, from the revenue of the several lines. Schools to be constructed to accommodate at least 800 boys or 800 girls, as the expense per head for smaller numbers would be, in Sir Andrew Clarke's opinion, almost prohibitory.

36. The Agents stated that they would, after communication with their London Boards, address Government on this matter.

The Conference adjourned till 11 A.M. on Monday the 17th February.

No. 6.

37. The Conference re-assembled at 11 A.M. on Monday, the 17th February.

PRESENT:—As at meeting No. 5.

38. The minutes of the previous meeting were read.

39. Colonel Sir Andrew Clarke, K.C.M.G., C.B., R.E., joined the Conference.

40. The draft Railway Act was read clause by clause, and various suggestions and alterations were noted for the consideration of the Select Committee to which the Bill had been referred.

41. With reference to minute No. 33, the following resolution was passed:—

The Conference is of opinion that it is necessary to establish provident funds on all railways irrespective of surplus profits. They therefore suggest that Mr. Saunders' proposal, as well as one submitted by Mr. Mathew,† be referred to the various Boards of Directors and the Government of India, with a view to ascertain if they would be prepared to contribute to such a fund out of working expenses; and if so, to what extent.

The Conference was dissolved.

CALCUTTA; *The 17th February* 1879.

J. S. TREVOR, *Colonel*, R.E., *President.*

Proposed Conference to consider General Rules and Regulations for Indian Railways.

OBSERVATIONS.—At the Railway Conference assembled at Calcutta in February last, the following resolutions were passed, *viz.*:—

(1) "In the opinion of this Conference, a revised set of general rules and regulations for all Indian railways should be compiled and published under section 14* of the new draft Act, or under the corresponding section of the Act as passed."

* Section 8 of the Railway Act of 1879.

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* Attached.

† Printed and attached.

(2) "Government be asked to appoint an officer to compile the rules and regulations, and that the Agent of each Company be requested to decide, on behalf of his own Company, on the adoption or modification of such rules."

(3) "The Agents of the several Companies be invited to send in to the Secretary of the Railway Conference any new rules or regulations they would like added to those now in force on their lines, and also any corrections or alterations they wished to have made in the existing rules."

2. Several sections of the rules have now been revised and circulated for the consideration of the several Railway Administrations, and the remaining sections are in the press and will issue shortly.

RESOLUTION.—The general rules and regulations hitherto in force have remained the same with little alteration for the last twenty-four years. These were based on the railway practice of the day in England, and only one set of rules was allowed for all Indian railways.

2. Under the present law (section 8 of Act No. IV of 1879), every railway Administration is bound to make general rules for the purposes set forth, and such rules require the sanction of the Governor General in Council before they can take effect.

3. Under the same Act, section 26, it is a punishable offence for any railway servant to disobey "any rule or order not inconsistent with the general rules aforesaid, and which such servant was bound by the terms of his employment to obey, and of which he had notice."

4. As most Indian railways are now connected, and as several junction stations are common to two railways, and as in some instances the trains of one line work over portions of another line, and further as the subsidiary rules above described do not require formal sanction, the Governor General in Council is pleased to decide that, in the interests of good administration and of public safety and convenience, there should be, as far as practicable, one set of general rules applicable to all Indian railways.

5. With the view of compiling such a set of general rules it is proposed to hold a conference of Railway Delegates next cold season, by which time the opinions of all Railway Administrations on the revised drafts which have been circulated should have been received, and the work of deciding on a satisfactory code rendered comparatively easy.

6. The exact time and place of the proposed Conference will be notified hereafter; but in the meantime the Agents of Guaranteed Railway Companies should be invited to cooperate and nominate one or more Delegates to represent their railways.

Proceedings of the Railway Conference held at Calcutta in January 1880.

OBSERVATIONS.—The Conference of Railway Delegates assembled at Calcutta on the 6th January in accordance with Government of India Resolution now read again, and was attended by the following gentlemen:—

MAJOR-GENERAL J. S. TREVOR, R.E., Director General of Railways ...		*President.*
BRADFORD LESLIE, Esq., C.E., Agent and Chief Engineer, East Indian Railway Company		*Vice-President.*
D. W. CAMPBELL, Esq., Locomotive Superintendent	Delegates	E. I. Ry. Co.
N. ST. L. CARTER, Esq., Traffic Manager		
G. A. BARNETT, Esq., Agent	„	G. I. P. Ry. Co.
H. CONDER, Esq., General Traffic Manager		
F. MATHEWS, Esq, C.E., Agent and Chief Engr.	Delegate	„ B., B. & C. I. Ry. Co.
D. Ross, Esq., Traffic Manager	Delegates	„ S., P. & D. Ry. Co.
C. SANDIFORD, Esq., Loco. Supdt.		
T. COX, Esq., C.E., Offg. Chief Engr.		
S. HARTWELL, Esq., Deputy Agent	„	„ O. & R. Ry. Co.
J. G. COOKE, Esq., Loco. Supdt.		
FRANKLIN PRESTAGE, Esq., Agent	„	„ E. B. Ry. Co.
J. BRANDER, Esq., Loco. Supdt.		
A. M. SAUNDERS, Esq., Agent and Manager	Delegate	„ Madras Ry. Co.
F. H. TREVITHICK, Esq., Loco. Supdt.		
W. S. BETTS, Esq., Agent	„	„ S. I. Ry. Co.
CAPT. W. A. J. WALLACE, R.E., Engr.-in-Chief and Manager	Delegates	„ Bengal State Rys.
A. W. RENDELL, Esq., Loco. Supdt.		
G. L. MOLESWORTH, Esq., C. E., Consg. Engr. to Govt. of India	„	„ State Railways.
COL. J. G. MEDLEY, R.E., Consg. Engr. for Guaranteed Railways to the Govt. of India		
CAPT. W. J. ENGLEDUE, R.E., Offg. Manager, Dhond and Manmad State Railway.		
CAPT. R. A. SARGEAUNT, R.E., Depy. Consg. Engr. for Guantd. Railways, Secretary to the Conference.		

2. The Conference held seven meetings, and was dissolved on the 13th January.

3. The Conference was convened for the purpose of revising the code of Rules and Regulations for Indian railways, and also for considering the question of adopting some uniform system of recording locomotive miscellaneous services. Other subjects hereafter mentioned, however, were permitted to be brought forward, and were fully discussed.

4. The draft Code of Rules and Regulations, which had been previously circulated, was discussed; and after laying down general principles and fixing certain salient points, a Sub-Committee of ten was appointed to consider the rules in detail. The following are the names of the gentlemen elected to serve :—

G. L. MOLESWORTH, Esq., Consulting Engineer for State Railways ... *Chairman.*

W. S. BETTS, Esq., Agent, South Indian Railway Co.

F. PRESTAGE, Esq., Agent, E. B. Railway Co.

S. HARTWELL, Esq., Deputy Agent, O. and R. Railway Co.

D. W. CAMPBELL, Esq., Locomotive Superintendent, E. I. Railway Co.

N. ST. L. CARTER, Esq., Traffic Manager, E. I. Railway Co.

H. CONDER, Esq., General Traffic Manager, G. I. P. Railway Co.

D. ROSS, Esq., Traffic Manager, S., P. and D. Railway Co.

F. H. TREVITHICK, Esq., Locomotive Superintendent, Madras Railway Co.

A. W. RENDELL, Esq., Locomotive Superintendent, N. B. State Railway.

5. The existing rules for the record of train-mileage and locomotive services were revised.

6. On the proposal of Mr. Mathew, it was agreed to recommend that "the carriage of material, including coal and ballast, on Revenue Account be charged to the Department requiring the material."

7. At the request of the Delegates from the East Indian, Madras and Great Indian Peninsula Railways, a rule regarding the interchange of rolling stock at junctions was passed subsidiary to Rule XVII of the Conference of 1879.

8. On the motion of Captain Wallace, it was decided to solicit Government to appoint a Committee to revise the forms of statistics of railway working.

9. Mr. Campbell brought forward the advisability of adopting one system of continuous brakes for all Indian railways.

10. On a proposition by Colonel Medley, the establishment of a central clearing-house was considered; and it was found to be the opinion of the Conference that the time had not yet arrived for such an institution.

11. A memorandum on the claims of Guaranteed Railway staff to Government pensions and retirement allowances signed by nine of the Delegates was recorded.

12. Certain questions were raised as to the application of the Government Savings Bank rules to Guaranteed Railway employés.

13. The adoption of an uniform goods classification for all India was considered, and an opinion recorded.

RESOLUTION.—The Government of India learns with satisfaction that a code of general Rules and Regulations for all Indian railways is in course of preparation, and awaits the result of the labors of the Sub-Committee.

The opinions given on the system of recording train-mileage and locomotive miscellaneous services will receive full attention; and revised rules based on the various resolutions passed should be prepared and submitted for sanction.

The proposal to charge for the carriage of all revenue stores would, if carried out, involve such a radical change in the Revenue Accounts that the Government of India hesitates to adopt it without further consideration, and desires to communicate with Her Majesty's Secretary of State on the subject before passing any definite orders.

It is trusted that the subsidiary rule, which has been added to the rules for the interchange of rolling stock passed at the Conference last year, will remove all difficulty experienced as regards this important question, and that the several Railway Companies will unite in render-

ing every facility in their power for the expeditious and effective working of through traffic by which the general welfare of the country as well as that of each railway undertaking is greatly affected.

A Committee will be appointed, as suggested, to revise the present form of railway statistics.

The Government of India considers the question of uniformity of continuous brakes for all connected railways one of great importance, and fully concurs in the views brought forward by Mr. Campbell; and, in order to avoid the adoption of various systems on different Indian lines, desires that no system be adopted without its previous sanction.

The thanks of the Government of India should be communicated to the Railway Delegates for the service they have rendered and for the valuable opinions they have recorded.

Proceedings of the Conference of Railway Delegates assembled at Calcutta on the 6th of January 1880, in accordance with Government of India, Public Works Department, Resolution No. 262—81R.T., dated 18th November 1879.

No. 1.

1. The Conference assembled at the Public Works Secretariat in Calcutta at noon on Tuesday, the 6th January 1880.

PRESENT:

MAJOR GENERAL J. S. TREVOR, R.E., Director General of Railways ...			PRESIDENT.
BRADFORD LESLIE, Esq., C.E., Agent and Chief Engineer, E. I. Ry. Co.			VICE-PRESIDENT.
G. A. BARNETT, Esq. Agent, H. CONDER, Esq., General Traffic Manager,	Delegates from	G. I. P. Ry. Co.	MEMBERS.
F. MATHEW, Esq., C.E., Agent and Chief Engineer,	„	„ B., B. & C. I. Ry. Co.	
D. ROSS, Esq., Traffic Manager, C. SANDIFORD, Esq., Locomotive Superintendent,	„	„ S., P. & D. Ry. Co.	
T. COX, Esq., C.E., Officiating Chief Engineer, S. HARTWELL, Esq., Deputy Agent, J. G. COOKE, Esq., Locomotive Superintendent,	„	„ O. & R. Ry. Co.	
FRANKLIN PRESTAGE, Esq., Agent, J. BRANDER, Esq., Traffic Superintendent,	„	„ E. B. Ry. Co.	
CAPTAIN W. A. J. WALLACE, R.E., Engineer-in-Chief and Manager, Northern Bengal State Railway, A. W. RENDELL, Esq., Locomotive Supdt., N. B. S. Ry.,	„	„ Bengal State Railways	
G. L. MOLESWORTH, Esq., C. E., Consg. Engr. to Govt. of India, COL. J. G. MEDLEY, R.E., Consg. Engr. for Guaranteed Railways to the Government of India, CAPTAIN W. J. ENGLEDUE, R.E., Offg. Manager, D. and M. State Railway,	„	„ State Railways	
D. W. CAMPBELL, Esq., Locomotive Superintendent, N. ST. L. CARTER, Esq., Traffic Manager,	„	„ E. I. Ry. Co.	
W. S. BETTS, Esq., Agent,	Delegate	„ S. I. Ry. Co.	
CAPTAIN R. A. SARGEAUNT, R.E., Deputy Consg. Engr. for Railways ...			Secretary to the Conference.

The following telegram was received from Madras :—

"Agent and Locomotive Superintendent, Madras Railway, will reach Calcutta on Thursday night for Conference."

2. The Conference proceeded to consider the general Rules and Regulations.

As in the general opinion of the Conference the draft rules entered into too much detail, it was agreed in the first instance to decide on what points rules should be drawn up and submitted for the sanction of the Governor General in Council in accordance with section 8 of the Railway Act of 1879, for general adoption on all Indian railways.

3. Mr. Conder, General Traffic Manager, Great Indian Peninsula Railway, remarked that, as the Conference was constituted, it was a question whether each delegate should have a separate vote, and proposed that—

The State Railways combined and that each Railway Company have only one vote each. On this point there was some discussion; but it was decided that votes should be taken individually, each delegate having one vote.

4. The subjects comprised in sections I, II, III and VI having been discussed, it was agreed that the following rules of the draft be struck out, being replaced, where necessary, by subsidiary rules framed by each Railway Administration, *viz.* :—Rules 4, 23, 29, 32, 33, 34, 37, 39, 40, 41, 44, 48, 97, 138 (first paragraph), 148, 151, 153, 154, 158, 163 and 165.

It was also decided that—

Rule 129 be transfered to section VIII, "Guards."

Rule 163 be replaced by a new rule.

Rules 167 and 168 be transferred to section I, and that—

Rule 169 be placed after Rule 171.

The Conference adjourned till the following day.

No. 2.

5. The Conference re-assembled at 11 A.M. on Wednesday, the 7th January.

PRESENT :—As at Meeting No. 1.

6. The consideration of the general Rules and Regulations was continued; and the subjects comprised in sections IV, V, VII, VIII and IX as far as Rule 293 having been discussed, it was agreed that the following rules of the draft be struck out, *viz.* :—63, 78, 84, 86 to 93 inclusive, 175, 176, 180, 183, 187, 197, 206, 212, 218, 225, 226, 228, 229 (last two paragraphs), 232 (first paragraph), 237, 239, 249, 252, 253, 254, 256, 260, 261, 288 (last two paragraphs), 290 (last paragraph).

It was also decided that—

Section V should be re-cast so as to conform more closely to the existing practice on Indian railways.

That—

The note at head of Section VI should be incorporated in the definitions, and that—

Rules 191, 223 and 289 be entirely re-cast.

From Rule 224 to omit from "when" in line 4 to "station" in line 8.

In Rule 278 the latter portion stands as follows —"without a written order, except in cases of unavoidable necessity to be established by the engine driver."

In Rule 282 the portion after "distant signal" in line 7 be omitted.

The Conference adjourned till the following day.

No. 3.

7. The Conference re-assembled at 11 A.M. on Thursday, the 8th January.

PRESENT :—As at previous meetings, with the addition of—

A. M. SAUNDERS, Esq., Agent and Manager
F. H. TREVITHICK, Esq., Locomotive Superintendent
} Delegates from Madras Railway Company.

8. The consideration of the general rules and regulations was continued to the end of section X.

It was decided that the following portions of the draft be struck out, *viz.*,—

In rule 294 from the word "when," line four, to the word "station" inclusive; rules 296, 298; paragraph 3, 300, paragraph 2, the words "and must not stop short of, or overrun the platform"; 300 paragraph 5, in note 303 all words after "operation," rules 305, 306, 307, paragraph 1, 309, 310, 316, 320, 321, 322, 322a.

It was decided that the following rules be added in the proper place, *viz.*—

Engine drivers with trains must run within the limits of speed fixed for the section of the line they are upon; but these limits, on the 5′ 6″ gauge are not on any line to exceed for passenger trains 60 miles an hour, and for goods or mixed trains 30 miles an hour, and on the metre gauge, are not to exceed for passenger trains 40 miles an hour and for goods or mixed trains 20 miles an hour.

Engine drivers with trains must not make up between stations more time than is allowed to be made up in that distance by the Railway Administration.

It was agreed to strike out the following, *viz.* :—

Rules 332, 334, 344 paragraph 2, 345, in rule 346 the words from "every" to "also" inclusive, 347, 348 the words "in a length of at least twenty yards," 360 the words "to secure themselves from the risk of passing trains," 361, 364, 365, 366.

It was decided that—

in 335 for "one mile" read "½ mile on the level and ¾ mile on a falling gradient steeper than 1 in 250," in rules 336 and 338 that "a quarter of a mile" be substituted for "half a mile," and after "mile" in 338, paragraph 1, add "or such lower speed as may be ordered."

That—

A general rule on the subject of rule 345 be added to section I.

Rule 340 be modified as follows:—

No lorry used for the conveyance of material, trolly for the conveyance of men may, in any case, be placed on the line, except by the authorized person, who is responsible for its proper protection and use according to the rules in force on the Railway.

In 339 for "is" substitute "loaded or empty," and omit the words "or men along the line," for "three quarters of" substitute "half," for "any" substitute "a double."

That—

After the word "lorry" in rule 341, the words "or trolly" be added.

That after the word "due" in rule 342 the words be added "except on lines worked on the block system when the time must not be less than five minutes."

In 357 for "two feet" "three feet" be substituted.

9. It was proposed by Mr. Barnett that—

the consideration in detail of the rules generally agreed to, be referred to a Sub-Committee.

This was agreed to without dissent.

The Conference adjourned till the following day.

No. 4.

10. The Conference re-assembled on Friday the 9th January at 11 A.M.

Present:—As at meeting No. 3.

11. The President proposed that—

A Sub-Committee of ten members of the Conference, *viz.*,—

2	from the East Indian Railway,	1	from the B. B. and C. I. Railway,
1	„ O. and R. „	1	„ G. I. P. Railway,
1	„ S. P. and D. „	1	„ S. I. „
1	„ Madras „	2	„ State Railways,

be appointed to revise rules in detail.

And that the revised rules, when prepared, be circulated to the Railway Administrations for re-concurrence on general principles before submission for sanction of the Governor General in Council.

Mr. Saunders proposed as an amendment that—

From the General Conference, 3 Sub-Committees be formed from the 3 Executive Departments to consider and reframe the rules, and to report to the General Conference as soon as they have completed their work. It being suggested to them that one week should be sufficient for the purpose.

The amendment was lost.

Mr. Molesworth proposed that—

Four officers be elected by the Members of the Conference to consider the wording of the rules, *viz.*:—

An Agent,
An Engineer,
A Traffic Manager,
A Locomotive Superintendent,

and that a State officer nominated by the President be added to act as Chairman of the Sub-Committee, having only a casting vote.

This amendment was lost.

The original proposition being carried, the following were elected Members of the Sub-Committee, *viz.*:—

Mr. Molesworth, Chairman.

Mr. Carter.	Mr. Conder.
,, Campbell.	,, Trevithick.
,, Hartwell.	,, Betts.
,, Ross.	,, Prestage.

Mr. Rendell.

Colonel Medley proposed that—

In case no reply is received from any Railway Administration within six months of the date on which the revised rules are put in circulation, it shall be understood that such Administration has no objection to their being formally sanctioned.

12. This was carried *nem. con.*

13. The consideration of the general Rules and Regulations was continued.

It was decided that—

In Rules 368 all words after "train-guards" be struck out.

In Rules 371 the word "require" be substituted for "direct."

Rule 372 read "No ballasting is to be carried on except with permission of the Engineer in charge of the section of Railway."

Rule 373 be struck out.

Rule 376 be made to agree with 342.

Rule 377 be repeated in section of definitions.

In Rule 382 the words "when authorized" be struck out and after "fog" "or dust storm" be added.

Rule 383 read "Ballast trains may be run with a pushing engine on a written order, but in such cases the speed must not exceed fifteen miles an hour," or be recast in these terms to agree with Rule 295.

In Rule 386 the words "*viz.*, a tri-coloured hand lamp, red, green, and white flags and 12 detonating signals," be struck out.

In Rule 387 omit "locked."

Rule 389 be omitted.

In Rule 395 omit "person from."

In 398 for "test the" read "satisfy himself of the proper."

In Rule 401 for the words "when the following precautions must be adopted" substitute "on the authorized rules for working in such cases in force on the Railway."

The subsequent portion of section XIII be struck out.

14. On the proposal of Mr. Barnett it was agreed that the Sub-Committee be requested to revise Sections XIV, XV, XVI, XVII and XVIII, and frame a set of general rules for each system of working applicable to all Indian Railways.

Mr. Saunders observing that the system in force on the Madras Railway was not provided for, it was agreed that a section should be added to make good the omission.

Mr. Conder proposed that—

Rule 1 in Section I be modified as follows :—

Every line of Railway upon which engine power is used for the conveyance of passengers must be worked upon one of the following systems, namely—

A.—Line clear obtained by telegram by which either authority is given for one train only to run between any two stations at one time, or authority is given for trains to follow each other between any two stations at intervals.

B.—Train despatching,

C.—Train Staff and Ticket,

D.—Pilot Guard,

E.—One engine only,

in accordance with the Rules laid down in section * * for the several systems respectively.

Mr. Molesworth proposed as an amendment that—

Rule read—

Every line of Railway upon which engine power is used for the conveyance of passengers must be worked on one of the following systems, *viz.*:—

"Line clear and caution message."

"Absolute Block."

"Train Despatching."

"Train Staff and Ticket."

"Pilot Guard."

"One engine only."

in accordance with the Rules laid down in sections * * for the system adopted.

Mr. Saunders proposed as an amendment that—

The wording of Rule 1 be left to the Sub-Committee with instructions to define the systems under which lines may be worked with or without an electric telegraph.

The amendment being lost, Mr. Molesworth's amendment was put to the Meeting and carried.

15. Major A. Filgate, R.E., Officiating Accountant General, Public Works Department, joined the Conference.

System of recording shunting and other miscellaneous locomotive services.

16. Proposed by the President that—

All light engine running required to equalize the up and down traffic mileage be classed as traffic train-mileage, and that the divisions under train-miles run for the Traffic Department be—

Passengers.
Goods.
Mixed.
Light.

After discussion this was carried by a majority.

17. Proposed by Mr. Barnett that—

The mileage of mixed trains be divided between coaching and goods in the proportion of the mileages of goods and coaching vehicles on such trains, and that light engine mileage be reckoned as goods or according to the class of train from which the necessity for such light mileage arose.

This was agreed to.

18. Proposed by Mr. Mathew that—

In the opinion of this Conference it is desirable, and that it be recommended that the carriage of material, including coal and ballast, on revenue account be charged to the Department requiring the material.

The proposition was adopted.

The Conference adjourned till the following day.

No. 5.

19. The Conference re-assembled at 11 A.M. on Saturday the 10th January.

Present :—As at the latter portion of Meeting No. 4, with the exception of Colonel Medley and Captain Wallace, who were unavoidably absent.

20. Proposed by Mr. Leslie that—

Paragraph *c* of the existing Government rules as follows be adhered to.

Proposed by Mr Ross as amendment that—

The mileage of trains containing vehicles running on revenue account be divided on the same principle as that adopted for the division of mixed train, between coaching and goods.

The amendment being lost, the original proposition was carried.

21. Proposed by Mr. Cox that—

A mileage allowance be made per hour for the whole time engines are kept under steam for the Engineering Department.

Carried.

Mr. Cox proposed that a rider be added to the preceding, *viz.*, that—

The above rule does not apply to any time-table train running for the Engineering Department.

This proposition was lost.

22. Mr. Leslie proposed that—

The mileage allowance for engineering trains be at the rate of 8 miles an hour, with a minimum of 5 hours a day.

Mr. Trevithick proposed as an amendment that—

The mileage allowance for engineering trains be at the rate of 10 miles an hour with a minimum of 60 miles a day.

Mr. Cooke proposed as an amendment that—

The mileage allowance for engineering trains be at the rate of 6½ miles an hour.

Both amendments being lost, the original proposition was carried.

23. Proposed by Mr. Saunders that—

The time for engineering trains be reckoned from the time the engine is taken charge of each day by the Traffic Department for working the train until it is released from duty by the Traffic Department.

Carried.

24. Proposed by the President that—

The time occupied at stations by traffic train engines standing in steam be not taken into account.

Carried.

25. Proposed by Mr. Trevithick that—

If any engine is lighted up by order of the Traffic Department, but not used, a minimum allowance of five hours be made to the Locomotive Department as shunting mileage.

Proposed as an amendment by Mr. Carter, that "three hours" be substituted for "five hours."

The amendment was carried.

26. Mr. Campbell proposed that—

Any shunting done by train engines at road side, terminal and changing stations, beyond ten minutes shunting done to their own trains, be booked from commencement, a certificate for the same being obtained from the Station Master.

Mr. Conder proposed as an amendment that—

No shunting certificate be given for less than 15 minutes and that the first 15 minutes shunting be not reckoned.

The amendment was carried.

27. Mr. Campbell proposed that—

All shunting done by engines, specially provided at the request of the Traffic Department at terminal, changing, or other stations, be reckoned, and that the whole time such engines are "standing in steam" be allowed.

Carried.

28. Proposed by the President that—

The word "piloting" be struck out in clause *e* of the present Rules, and the words "standing in steam for traffic purposes" be inserted instead.

Carried.

29. Proposed by Mr. Campbell that—

All time of engines used for shunting or standing in steam for traffic purposes be reckoned at five miles an hour.

Mr. Saunders proposed as an amendment—

That the rate be fixed at 6 miles an hour.

The amendment being lost, the original proposition was carried.

30. Proposed by the President that—

The word "piloting" be limited to engines running for the protection of trains, and that the mileage of such engines be reckoned as traffic train-mileage.

Carried.

31. Proposed by Mr. Barnett that—

No record be kept of the time occupied in lighting fires, and getting in and out of shed.

Carried *nem. con.*

The Conference adjourned till Monday the 12th January.

32. At Meeting No. 6, when the proceedings were read for confirmation, it was—

Proposed by Mr. Molesworth that—

In the heads *d*, *e*, and *f* of the Government Rules the word "time" be struck out, and that the heads read—

(*d*)—Miles run in assisting disabled engines.

(*e*)—Miles run in shunting calculated at 5 miles an hour.

(*f*)—Miles run for miscellaneous services calculated on the actual distance run.

Carried.

33. Proposed by the President that—

The resolutions arrived at be embodied in a revised draft of rules for recording mileage, and that they be adopted from the 1st January 1880.

Carried.

No. 6.

34. The Conference re-assembled at noon on Monday the 12th January.

Present:—As at the latter portion of Meeting No. 4.

35. The proceedings of Meetings 1 to 5 were read, and the proposals shown in clauses 32 and 33 were added.

36. Mr. Saunders stated that—

Since the introduction of the rules for interchange of rolling stock passed at the last Conference, questions have arisen respecting the working of Rule XVII. And the East Indian and Great Indian Peninsula Railway Companies join with the Madras Railway Company in requesting that this rule may be discussed by the Conference before it separates.

It was agreed to discuss the question.

37. Proposed by Mr. Leslie and seconded by Mr Saunders that—

Rule XVII should only be brought into force when the daily average excess of wagons passing the junction in one direction exceeds for one week thirty per diem, and in that case the forwarding Company should not be called upon to take more than one-third of such exeess number in empties. The demurrage on these empties to be paid at the rate of two pies per ton of carrying capacity per hour instead of at the usual rate. This ruling to have force from the 1st January 1880.

Carried without dissent.

The Conference adjourned.

No. 7.

38. The Conference re-assembled at 11 A.M. on Tuesday the 13th January.

Present:—As at Meeting No. 6.

39. The proceedings of Meeting No. 6 were read and confirmed.

40. Proposed by Mr. Ross that—

To ruling in minute 37 the following be added—

That forty-eight hours' notice be given by wire by the receiving Company of its intention to forward empties.

This was agreed to.

41. Proposed by Mr. Leslie that—

In addition to the resolution in minute 17—

It also be recommended that in statistics of Railway working, the results be shown on passenger, ton and vehicle mileage, as per attached extract of letter dated the 7th December 1878 (printed Appendix).

Proposed by Captain Wallace as an amendment—

That the present statistical returns require revision, with a view to uniformity in the statements prepared, and a reduction of the quantity of useless information furnished at great labor and expense. Government be requested to appoint a Committee to make this revision at an early date, and that Mr. Leslie's memorandum, dated 7th December 1878, be placed before the Committee for careful consideration.

The amendment was carried.:

42. Proposed by Mr. Campbell that—

Proposals having been put forward for the introduction of continuous brakes, it is recommended that one system be adopted on all Indian Railways, in order that vehicles belonging to the different Railways may be so fitted as to be easily interchangeable; thus avoiding the very great inconvenience, insecurity and expense at present found to be the case on English Railways through so many different kinds of continuous brakes being in use of lines running in connection with one another.

Adopted.

43. Proposed by Colonel Medley, seconded by Mr. Saunders that—

In the opinion of this meeting, the time has arrived for the establisment of a Railway Clearing House in some central position (such as Jubbulpore) for the whole system of Indian Railways on the basis of the English clearing house, and that the Government be asked to undertake the subject accordingly.

For the proposition ...	3 votes.
Against	15 „

Lost.

44. Mr. Mathew, seconded by Mr. Saunders, desired that the following might be recorded in the minutes. This was agreed to :—

The undersigned members of the Conference, before separating, desire to submit to Government, and to the Home Boards of the Guaranteed Companies, the claims of the members of Railway staff in India to such privileges as regards pensions and retirement allowances as Government has allowed to the members of every other branch of the public service in this country.

2. The cost of pensions and retirement allowances would, in part, fall on the Railway shareholders, and the undersigned are confident that the Railway Companies would willingly contribute their share on any scale adopted and recommended by Government.

3. The Members of the Indian Railway Staff, whose services Government has frequently in formal resolutions acknowledged, have, now, during several years, been looking forward to a settlement of the claims which they have submitted; and, after the meeting of this Conference held a year ago, it was hoped that suitable regulations would have been established.

4. Looking to the progressive increase of the revenue from Indian Railways and the further growth of that revenue, which may with confidence be anticipated, it is submitted that the provision of pension and retirement allowances for the members of the staff may be made—without disturbing the financial budget of the department—with real advantage to the public service and to the Railway Companies, as well as to the members of the working establishment.

5. The undersigned, with the conviction that the measure, whilst being only fair to the members of a service which has most arduous duties to perform, would also, by offering an inducement to continuous service, and by facilitating retirement in due time, conduce to efficient and economical working of undertakings which have now become of great magnitude, beg most respectfully to submit the subject for the consideration of Government.

A. M. SAUNDERS, Agent and Manager, Madras Railway.

W. S. BETTS, Agent, South Indian Railway.

F. MATHEW, Agent and Chief Engineer, Bombay, Baroda and Central India Ry.

F. PRESTAGE, Agent, Eastern Bengal Railway.

J. BRANDER, Traffic Superintendent, Eastern Bengal Railway.

F. H. TREVITHICK, Locomotive Superintendent, Madras Railway.

J. G. COOKE, Locomotive and Carriage Superintendent, Oudh and Rohilkhund Railway.

C. SANDIFORD, Locomotive and Carriage Superintendent, Scind, Punjab and Delhi Railway.

T. COX, Acting Chief Engineer, Scind, Punjab and Delhi Railway.

D. ROSS, Traffic Manager, Scind, Punjab and Delhi Railway.

45. Mr. Conder brought up the rules lately promulgated for the formation of State Railway Savings Banks, and enquired whether the Government of India would withdraw, in the case of the servants of Guaranteed Railway Companies, the restriction of deposits to a maximum of Rs. 5,000 in one year, and also whether Government were disposed to listen favourably to any proposals for the extension of these rules to Guaranteed Companies.

The President, in reply, stated that there would probably, on application, be no objection to cancel the maximum annual limit for deposits, and that the Government of India would be inclined to regard with favour any suggestion for the extension of the State Railway Savings Banks rules to Guaranteed Companies, but that no pledge could be given, as the question would have to be referred for the orders of the Secretary of State.

Recorded.

46. Enquiry was made by the President whether it would be desirable on another occasion to bring before a Conference the question of the adoption of an uniform goods classification for all India.

On the matter being discussed it appeared that in the opinion of the Members it was certainly desirable that differences in the classifications of the several Railway Administrations should be removed as far as possible, and it was gathered that communications were frequently passing between Traffic Managers with this object. It was, however, impossible in a large country like India to obtain the desired result without experience and careful study of the local peculiarities of Railway goods traffic. Under these circumstances it was considered that the time had not yet arrived when a satisfactory result could be hoped for from a discussion at a Conference, and it was decided that the subject should be left to the several Railway Administrations with a recommendation that the removal of variations should continue to receive the attention of the traffic officers.

The Conference was dissolved.

APPENDIX E.

Report of the Committee appointed to consider the question of Wind Pressure on Railway Structures.

The disaster of the Tay Bridge led to the appointment by the Board of Trade of a Committee to consider the question of wind pressure on Railway Structures.

The following distinguished gentlemen were appointed to serve on the Commission :—

Sir William George Armstrong, C.B., F.R.S.
William Henry Barlow, Esq., F.R.S.
Sir John Hawkshaw, F.R.S.
Professor George Gabriel Stokes, M.A., D.C.L., F.R.S.
Colonel William Yolland, R.E., F.R.S.

The report has been published, and is so extremely interesting that extracts from it are published in this report :—

WIND PRESSURE (RAILWAY STRUCTURES) COMMISSION.

To the Right Honourable the President of the Board of Trade.

London, May 20th, 1881.

SIR,—In compliance with the instructions from the Board of Trade (a copy of which is given in the Appendix) to consider the question of wind pressure on railway structures, and to report to them on the subject, we have made such inquiries and procured such information on the subject referred to us as we deemed necessary, and have now the honour to report the conclusions at which we have arrived.

It was necessary in the first instance to ascertain as accurately as possible from the sources which were accessible to us what the highest pressures of the wind in this country amount to. With this object we obtained from those observatories and stations where the pressure or velocity of the wind is measured the statements which we give in the Appendix. In order to exhibit the action of the wind during heavy storms, we have also appended lithographed copies of wind diagrams taken by means of self-registering apparatus at Bidston, Glasgow and Greenwich.

At some of the stations from which we have obtained returns the wind pressures are measured directly by Osler's self-registering pressure anemometers; at others the velocity only of the wind is measured by Robinson's rotating anemometers, the velocity of the wind being taken at three times the velocity of the revolving cups.

For some stations the only published information is the run in miles of the wind during each hour. These can obviously be no more than a general accordance between this and the greatest pressure experienced during the hour. To utilize for our purpose observations taken at stations where the velocity only of the wind is recorded, the records of the Bidstone Observatory, where both elements are recorded, have been employed as furnishing a means of connection between the two. In the case of high winds, with which alone we have to deal, it was found that the greatest pressure recorded in an hour was tolerably well proportional to the square of the mean velocity during the hour, and that the empirical formula $\frac{V^2}{100} = P$, where V = maximum run in miles of the wind in any one hour and P = maximum pressure in pounds on the square foot at any time during the storm to which V refers, represented very fairly the greatest pressure as deduced from the mean velocity for an hour. We have accordingly given in the Appendix a table calculated from the above formula for deducing maximum pressures from observed velocities.

In addition to the tables obtained from English, Irish and Scottish stations, which are those only that are strictly applicable to our inquiry, we give as matter of information a summary of strong winds registered at stations on the Continent and in India.

It will be seen on reference to the Tables that the wind pressures vary greatly at different stations. This, no doubt, mainly arises from difference of exposure of the stations to the action of the wind in consequence of the geographical and local circumstances of their position, but may in some cases be partly caused by differences in the instrument used for measurement. Thus at Glasgow the highest recorded pressure per square foot is 47 lbs., while at Bidston near Liverpool the indicated pressure on one occasion amounted to 90 lbs., and on another occasion to 80 lbs.

But the pressures at Bidston seem very abnormal, being much beyond what have been noticed at any of the other stations. The conformation of the ground on which the Bidston Observatory stands is such that the velocity of the wind there might be greatly intensified.

It will be noticed in the lithographs that the records of exceptional high pressures indicate a very brief duration. From inquiries we have made, we are satisfied that these records are not referable to instrumental error, depending on the recording instrument being carried by its momentum beyond the position of equilibrium under the wind pressure acting at the moment, but represent a real phenomenon. But whether the exceptionally high velocities to which such pressures are due extend over a considerable space in a lateral direction, or, on the other hand, are extremely local, is a point on which we have not been able to find experimental evidence.

The differences of the wind pressures observed at different stations led us to consider whether there were any other modes of approximately ascertaining the force of the wind for our purpose. There are many buildings, tall chimneys, ship building sheds, &c., which probably would not withstand pressures so extreme as those we refer to; but in most cases the contour of the adjoining ground, and the obstruction to wind by adjoining buildings, trees, and other surrounding objects would render conclusions drawn from such cases unreliable. It occurred, however, to us that some useful information might be drawn from another source, *viz.*, from railways themselves.

It is obvious that on existing railways that have been long in use, a series of experiments, if we may apply such an expression to them, have for many years been carried on; for over them trains have been running at all times of the day and night on high and unsheltered embankments and along other spaces exposed in many cases to very strong winds.

Now, a wind pressure varying from 30 to 40 lbs. per square foot is sufficient to overturn the ordinary railway carriages that have been in use during the last twenty-five or thirty years; and we thought it useful to inquire from the different Railway Companies for cases where railway carriages have been overturned by the force of the wind. The only cases of this kind that have been brought to our knowledge are appended to this Report.

From the information thus acquired, from the inquiries we have made, and from the consideration we have given to the subject, we are of opinion that the following rules will sufficiently meet the cases referred to us :—

(1) That for railway bridges and viaducts a maximum wind pressure of 56 lbs. per square foot should be assumed for the purpose of calculation.

(2) That where the bridge or viaduct is formed of close girders, and the tops of such girders are as high or higher than the top of a train passing over the bridge, the total wind pressure upon such bridge or viaduct should be ascertained by applying the full pressure of 56 lbs. per square foot to the entire vertical surface of one main girder only. But if the top of a train passing over the bridge is higher than the tops of the main girders, the total wind pressure upon such bridge or viaduct should be ascertained by applying the full pressure of 56 lbs. per square foot to the entire vertical surface from the bottom of the main girders to the top of the train passing over the bridge.

(3) That where the bridge or viaduct is of the lattice form or of open construction the wind pressure upon the outer or windward girder should be ascertained by applying the full pressure of 56 lbs. per square foot, as if the girder were a close girder, from the level of the rails to the top of a train passing over such bridge or viaduct, and by applying in addition the full pressure of 56 lbs. per square foot to the ascertained vertical area of surface of the ironwork of the same girder situated below the level of the rails or above the top of a train passing over such bridge or viaduct. The wind pressure upon the inner or leeward girder or girders should be ascertained by applying a pressure per square foot to the ascertained vertical area of surface of the ironwork of one girder only situated below the level of the rails or above the top of a train passing over the said bridge or viaduct, according to the following scale, *viz.* :—

(*a*) If the surface area of the open spaces does not exceed two-thirds of the whole area included within the outline of the girder, the pressure should be taken at 28 lbs. per square foot.

(*b*) If the surface area of the open spaces lie between two-thirds and three-fourths of the whole area included within the outline of the girder, the pressure should be taken at 42 lbs. per square foot.

(*c*) If the surface area of the open spaces be greater than three-fourths of the whole area included within the outline of the girder, the pressure should be taken at the full pressure of 56 lbs. per square foot.

(4) That the pressure upon arches and the piers of bridges and viaducts should be ascertained as nearly as possible in conformity with the rules above stated.

(5) That in order to ensure a proper margin of safety for bridges and viaducts in respect of the strains caused by wind pressure, they should be made of sufficient strength to withstand a strain of four times the amount due to the pressure calculated by the foregoing rules. And that, for cases where the tendency of the wind to overturn structures is counteracted by gravity alone, a factor of safety of 2 will be sufficient.

With regard to the eighth paragraph of the Report of the Select Committee on the North British Railway (Tay Bridge) Bill, to which you have drawn our attention, we beg to observe that where trains run between girders they will generally be sufficiently pro-

tected from the wind, the degree of protection afforded by the girders depending on the extent to which the girders are open or close; where the girders are so open as to afford insufficient protection, or where trains run, as in some cases they may do, on the tops of girders, we assume that the engineer will provide a sufficient parapet; but we are indisposed to go further into detail on this subject, as it might tend to stereotype modes of construction, which we think is undesirable.

In conclusion, we beg to point out that the velocity of wind, like that of every other moving body, is more or less retarded by friction, and will be affected therefore by the character of the surfaces over which it has to pass, which may be rough, smooth, or irregular. It will follow, therefore, that other things being the same, greater velocities will be attained at higher altitudes than at low ones, the wind at higher altitudes being further removed from retardation by friction.

Though we are of opinion that no bridge or viaduct is likely to be built in such a situation as to expose it to wind pressures equal to those which have been occasionally indicated by the disc on the Bidston Observatory, yet even if that were possible, a bridge or viaduct constructed according to the rules we have given would not be subjected to strains nearly equal to its theoretical strength.

On the other hand, there will be many structures of small altitude or in sheltered situation which never can be exposed to the wind pressure we have assumed, and where the application of the rules we have given would require modification.

Some modification of the rules may else be required in the case of suspension of other bridges of very large span; but such cases will be of rare occurrence, and we recommend that they should be specially considered when they arise.

We have the honour to be,

SIR,

Your most obedient Servants,

JOHN HAWKSHAW.
W. G. ARMSTRONG.
W. H. BARLOW.
G. G. STOKES.
W. YOLLAND.

We, the undersigned, concur in the above Report so far as it goes; but we think the following clause should be added, *viz.* :—

The evidence before us does not enable us to judge as to the lateral extent of the extremely high pressure occasionally recorded by anemometers, and we think it desirable that experiments should be made to determine this question. If the lateral extent of exceptionally heavy gusts should prove to be very small, it would become a question whether some relaxation might not be permitted in the requirements of this Report.

W. G. ARMSTRONG.
G. G. STOKES.

Extract from a letter dated 11th August 1880 from H. G. Calcarft, Esq. (Assistant Secretary, Railway Department, Board of Trade), to W. Airy, Esq. (Secretary to the Wind Pressure Commission); referred to in page 2 of the foregoing Report.

"I am further to enclose a copy of the Report of the Select Committee on the North British Railway (Tay Bridge) Bill of the present session; and in drawing your attention to paragraph 8, in which the Committee refer to the question of providing shelter from the wind for trains passing over the bridge, to suggest for the consideration of the Committee that this point might be included in the scope of their inquiry."

Paragraph 8 of the Report of the Select Committee on the North British Railway (Tay Bridge) Bill.

"No provision for giving any shelter to the train from the wind during its passage over the bridge was included in the scheme before the Committee. This subject they consider most important, and it will no doubt receive the attention of the Company's Engineer in preparing plans for the reconstruction of the bridge.

Summary of Strong Winds registered at Stations in England and Scotland where the pressures were measured directly by Osler's Self-registering Anemometers.

GLASGOW.

The Osler anemometer is at a height of 40 feet above the ground, and 218 feet above mean sea level. It is placed on the top of the observatory, which stands on a hill of no great height on the outskirts of Glasgow, and it is fully exposed to the wind on the south and west,

though sheltered to some extent on the north and east by tall buildings and hills. The area of the pressure plate was at first 1·3 square feet, afterwards 1 square foot, and subsequently 2 square feet.

Recorded Maximum Pressures up to or above 30 lbs. on the Square Foot from 1861 to 1873.

Date.	Maximum Pressure in Lbs. per Sq. Foot.	Date.	Maximum Pressure in Lbs. per Sq. Foot.
1861—January 24	30	1862—October 19	33
February 2	38	„ 27	36
March 6	45	December 15	30
„ 8	40	„ 18	42
„ 17	47	1863—January 19	45
August 18	34	„ 22	40
October 13	30	„ 26	40
November 19	33	October 29	45
„ 21	34	1864—February 13	40
„ 24	42	1865—December 30	35
1862—January 9	38	1866—December 28	31
June 7	35	1868—January 24	40
July 19	35	April 29	32
October 17	40		

NOTE.—No pressures up to 30 lbs. recorded during the years 1869, 1870, 1871, 1872, 1873.

GREENWICH.

The anemometer is at a height of 56 feet above the ground, and 213 feet above mean sea level. It is placed on the top of the observatory, which stands on the brow of a hill breaking down very steeply towards the north. The exposure of the anemometer to the wind is complete and extremely severe. The area of the pressure plate during the years referred to in the table was 2 square feet.

Recorded Maximum Pressures up to or above 25 lbs. on the Square Foot from 1872 to 1878.

Date.	Maximum pressure in Lbs. per Sq. Foot.	Date.	Maximum Pressure in Lbs. per Sq. Foot.
1872—January 4	25·1	1873—November 27	30·0
„ 5	*42·0+	1874—December 8	29·0
„ 17	*42·0+	1875—January 24	30·0
„ 18	30·0	„ 25	*42·0+
„ 23	*42·0+	June 12	25·0
„ 24	30·0+	November 6	25·0
March 27	30·0	1876—March 12	25·0
„ 28	*42·0+	„ 15	35·0
November 26	*42·0+	1877—February 20	27·5
December 7	30·0	April 16	34·0
„ 8	*42·0+	„ 17	29·3
1878—January 4	35·0	November 11	32·6
„ 18	31·0	1878—August 30	34·0

NOTE.—The instrument did not record pressures greater than 42 lbs. on the square foot. On those occasions when the pressure is marked thus (42·0+ in the above table, the plate was repeatedly forced back to the extreme limit of its range by the wind, and the maximum pressure was undoubtedly greater than 42 lbs. This was specially the case with the storm of December 8th, 1872, when from the violence of the back-lash indications of the pencil trace, there is reason for thinking that the maximum pressure must have exceeded 50 lbs., and probably approached 60 lbs. on the square foot.

ADDENDUM.—In the month of May 1880, the anemometer at the Greenwich Observatory was altered so as to record pressure somewhat greater than 50 lbs. per square foot, by the reduction of the area of the pressure plate from 2 square feet to 1½ square feet, and the anemometer was carefully adjusted and verified. On the 18th January 1881 an extremely violent gale from the east occurred, and the anemometer recorded pressures up to or greater than 50 lbs. per square foot four times during that storm. The highest pressure attained was 51½ lbs.

LIVERPOOL (BIDSTON).

The anemometer is at a height of 56 feet above the ground, and 251 feet above the mean sea level. It is placed on the top of the Bidston Observatory, which is situated on the top of a range of hills on the south side of the Mersey; these hills rise abruptly from the sea level on both sides, but specially on the west side. The exposure of the anemometer to the wind is complete and

remarkably severe. The area of the pressure plate was 4 square feet up to 1873, and was then reduced to 2 square feet.

Recorded Maximum Pressures up to or above 45 lbs. on the Square Foot from 1868 to 1879.

Date.	Maximum Pressure in lbs. per square foot.	Date.	Maximum pressure in lbs. per square foot.
1868—January 31st	51·2	1871—March 9th	90·0
February 1st	70·0	1872—November 6th	55·0
,, 4th	49·0	December 9th	57·0
,, 22nd	65·0	1874—January 2nd	50·5
March 8th	53·0	October 21st	50·0
April 21st	47·5	1875 January 20th	50·4
November 3rd	49.0	September 27th	70·0
December 27th	80·0	1877—January 30th	63·0
1869—January 31st	49·0	February 20th	45·5
February 27th	46·0	November 22nd	51·7
,, 28th	45·0	,, 23rd	63·5
March 1st	56·0		
September 19th	45·0	No pressures up to 45 lbs. recorded in the years 1878 and 1879.	
1870—September 10th	65·0		
October 13th	65·0		
,, 19th	50·0		
,, 20th	46·5		

Method of deducing the maximum pressure of the wind during a storm from the maximum run of wind in any one hour during the same storm.

At the stations of the Meteorological Office the actual run of the wind in miles is recorded from hour to hour throughout the day by a self-registering apparatus. But the pressures of the wind are not measured at those stations. In order to deduce the maximum pressures from the maximum runs of the wind in any one hour, it is necessary to have recourse to some good station where both of these sets of quantities have been measured. A table can then be formed giving the average relation which exists between the maximum pressure and the maximum runs of wind in any one hour at that station.

The station selected for the formation of such a table is the Bidston Observatory. This station is very suitable, both from the wide range of the velocities and pressures experienced, and from the care and order with which the observations have been recorded and published. The table has been formed from the published results of the Bidston observations from 1st January 1870 to 31st December 1878. The method of forming the table was as follows :—

As the object of the table was to deal with the higher velocities and pressures of the wind, no notice was taken of maximum hourly runs of the wind smaller than 35 miles in an hour. A first subsidiary table was then formed of all the maximum hourly runs of the wind lying between 35 and 45 miles in an hour with the maximum pressures corresponding: these were respectively added up and an average result obtained of a maximum pressure of 14·7lbs. per square foot for a maximum hourly run of the wind of 40 miles. A second subsidiary table was then formed of all the maximum hourly runs of the wind lying between 45 and 55 miles in an hour with the maximum pressures corresponding, and an average result obtained as before. A third subsidiary table was then formed of all the maximum hourly runs of the wind lying between 55 and 65 miles in an hour with the maximum pressures corresponding. And so on to the highest velocities registered. The results obtained in this manner were as follows :—

Maximum hourly run of the wind in miles.	Maximum pressure in lbs. on the square foot.
40	14·7
50	23·7
60	33·9
70	48·0
80	65·5

On an examination of the above figures it is seen that the pressures are very nearly proportional to the squares of the velocities in every case; and that the simple formula $\frac{V^2}{100} = P$ will serve with tolerable accuracy as the basis for the computation of a table connecting the maximum run of the wind in miles in any one hour (V) with the maximum pressure in lbs. on the square

m

foot (P) at any time during the storm to which (V) refers. The following table has been computed from the above formula :—

Table for converting maximum hourly runs of the wind into maximum pressures, calculated from the Formula $\frac{V^2}{100} = P$, where V = the maximum run in miles of the wind in any one hour, and P = the maximum pressure in lbs. on the square foot at any time during the storm to which V refers.

Maximum hourly run of the wind in miles.	Maximum pressure in lbs. on the square foot.	Maximum hourly runs of the wind in miles.	Maximum pressure in lbs. on the square foot.
40	16·0	71	50·4
41	16·8	72	51·8
42	17·6	73	53·3
43	18·5	74	54·8
44	19·4	75	56·2
45	20·2	76	57·8
46	21·2	77	59·3
47	22·1	78	60·8
48	23·0	79	62·4
49	24·0	80	64·0
50	25·0	81	65·6
51	26·0	82	67·2
52	27·0	83	68·9
53	28·1	84	70·6
54	29·2	85	72·2
55	30·2	86	74·0
56	31·4	87	75·7
57	32·5	88	77·4
58	33·6	89	79·2
59	34·8	90	81·0
60	36·0	91	82·8
61	37·2	92	84·6
62	38·4	93	86·5
63	39·7	94	88·4
64	41·0	95	90·3
65	42·2	96	92·2
66	43·6	97	94·1
67	44·9	98	96·0
68	46·2	99	98·0
69	47·6	100	100·0
70	49·0		

Summary of Strong Winds registered at Stations in India.

The pressure was in all cases measured directly by Osler's anemometers.

Bombay.

Recorded Maximum Pressures up to or above 10 lbs. on the Square Foot, from 1849 to 1865.

Date.	Maximum pressure in lbs. per sq. foot.	Date.	Maximum pressure in lbs. per sq. foot.
1849—June 21st	11·0	1856—May 21st	16·0
1850—Oct. 7th	11·0	„ 30th	14·0
Nov. 1st	14·0	„ 31st	11·0
1851—May 28th	10·0	June 1st	11·0
June 10th	11·0	1857 „ 25th	10·0
July 11th	13·0	1858— „ 24th	12·0
Aug. 1st	10·0	1859— „ 3rd	11·0
1852—June 21st	10·0	July 16th	11·5
Aug. 1st	11·0	1860—June 14th	16·0
1854—Nov. 1st	11·0	Oct. 16th	16·0
„ 2nd	38·0	1862—June 14th	10·7
1855—June 11th	10·5	1865	10·5

CALCUTTA.

Recorded Maximum Pressures up to or above 10 lbs. on the Square Foot, from 1870 to 1877.

Date.	Maximum pressure in lbs. per sq. foot.	Date.	Maximum pressure in lbs. per sq. foot.
1870—Apl. 8th	18·0	1874—Mar. 8th	18·0
„ 9th	40·0	Oct. 15th	12·0
1871— „ 3rd	30·0	1875—May 2nd	11·0
May 7th	19·5	„ 9th	34·0
„ 25th	22·0	„ 12th	14·0
„ 26th	11·4	„ 17th	13·0
1872—Apl. 1st	12·0	„ 24th	34·0
„ 4th	10·0	„ 26th	13·5
„ 23rd	11·2	„ 27th	12·0
May 18th	11·8	June 1st	10·2
1873—Apl. 28th	30·4	July 14th	11·2
May 3rd	10·3	1876—Mar. 16th	20·0
„ 4th	25·0	Nov. 1st	14·0
„ 24th	11·0	1877—Mar. 17th	40·0

DODABETTA.

An exposed station on the top of the Nilgherry Hills, 8,640 feet above the level of the sea.

Recorded Maximum Pressures up to or above 25 lbs. on the Square Foot, from 1847 to 1854.

Date.	Maximum pressure in lbs. per sq. foot.	Date.	Maximum pressure in lbs. per sq. foot.
1847—April 17th	*35·0+	1849—June 18th	26·0
May 24th	28·5	„ 22nd	26·0
June 12th	30·0	July 25th	29·0
July 25th	27·0	„ 29th	28·0
„ 26th	32·0	„ 30th	27·5
Sept. 8th	27·5	„ 31st	30·5
„ 8th	28·0	1851—May 3rd	36·0
„ 9th	28·0	June 9th	26·0
„ 10th	*35·0+	„ 10th	32·0
„ 30th	27·0	„ 11th	27·0
1848—April 26th	26·0	July 30th	32·0
June 2nd	29·0	„ 31st	38·0
„ 11th	29·0	August 1st	37·0
„ 13th	34·0	1852—June 21st	25·0
„ 14th	29·0	„ 24th	33·0
„ 17th	30·2	1853—March 27th	40·0
„ 18th	26·0	1854—July 14th	26·5
July 19th	25·5	„ 17th	27·0
1849—June 17th	34·5		

* The anemometer did not at these times record pressures greater than 35 lbs. No explanation is given concerning the pressures of 38 lbs. and 40 lbs. in the latter part of the table, and it is possible that the instrument may have been altered so as to record pressures higher than 35 lbs.

MADRAS.

Recorded Maximum Pressures above ½ lb. on the Square Foot, from 1841 to 1851.

Date.	Maximum pressure in lbs. per sq. foot (partly estimated).	Date.	Maximum pressure in lbs. per sq. foot (partly estimated).
1841—April 29th	8·1	1846—October 20th	*16·9
May 15th	12·2	November 24th	8·4
„ 16th	17·1	„ 25th	*33·8
1842—May 30th	7·6	1847—October 13th	15·7
June 17th	7·5	December 12th	7·6
July 24th	6·9	„ 13th	7·7
October 23rd	17·2	1848—March 3rd	11·0
„ 24th	16·0	May 1st	7·5
1843—May 20th	7·6	November 1st	8·7
„ 21st	9·7	1850—May 23rd	15·6
November 30th	7·3	1851—May 3rd	7·8
December 1st	7·9	„ 4th	22·7
1844—May 8th	6·6		
December 25th	6·6		
1845—May 24th	7·9		

* On these occasions the instrument failed to perform, and it is possible that the maximum pressures were even higher.

Note.—The published pressures in the Madras tables give the average force of the wind reckoned during 10 minutes before, and 10 minutes after each hour. The maximum of such published pressures has been increased 30 per cent. in the above table to obtain the probable maximum pressure of the day, this being, on an average, the proportion which existed in the Dodabetta observations, where both the average pressures and the maximum pressures are given.

List of Accidents to Railway Trains caused by the force of the Wind.

ENGLAND.

In September 1855 a goods and cattle train which was being run from Preston to Carlisle was brought to a stand by wind pressure on the Shap Bank, for about 20 minutes, and then three empty cattle wagons and three empty sheep vans, next to the engine, were blown over on their sides.

On the 5th January 1867 the 8·20 P.M. local mail train from Holyhead, consisting of two engines, breakvan, post-office van, three carriages, a guard's van, and a truck, came to a stand on a high embankment about two miles from the Aber station, on the Chester and Holyhead line, owing to the snow and the force of the wind. Just afterwards the coupling chain between the second engine and the first break-van separated, and a few minutes later the breakvan and the post-office tender were turned over on their sides.

On the 11th April 1876 the down night Irish mail, consisting of an engine and twelve vehicles, and on the 11th August, of the same year, the up night Irish mail train, consisting of an engine and 14 vehicles, were stopped dead by wind-pressure on the Chester and Holyhead Railway, between Gaerwen and Bodorgan, on what is known as the Llangaffo Bank, the gradient being 1 in 100.

About six years ago (*i.e.*, about 1874), exact date unknown, the down night Irish mail train was brought to a stand on the Llangaffo Bank by wind pressure, and also on the Llandulas Bank, between Abergele and Colwyn, on the Chester and Holyhead line, from the same cause. In the latter instance the train had to be divided and taken up the incline (the gradient of which is 1 in 100) in two parts.

In 1865, on the Festiniog railway, the gauge of which is 1′ 11½″, a van with not more than one cwt. of luggage in it was blown over on an embankment. The speed was about 12 miles an hour, upon a slight curve, the inner rail being ¾″ lower than the outer rail; the difference of level aiding the fall of the van.

INDIA.

On the 5th October 1864 on the Eastern Bengal Railway two trains were upset during a violent storm. One of these was a train of eight passenger vehicles and was upset near Echapore. The other was a train of 12 passenger vehicles and was upset near Arrunghatta. In both cases all the passenger vehicles were blown over on their sides. Besides these cases four wagons were blown from a siding at Baggoolah, and capsized about half-a-mile north of that station on the same day. Other accidents happened on the same day from collisions caused by wagons which were started from sidings by the force of the wind.

On the 21st September 1878, a long train of wagons travelling at about eight miles per hour, on the Eastern Bengal Railway was brought to a standstill by a heavy storm and was then forced back about a mile with full steam and brake against it; eighteen wagons were then detached, but even with half the train it was found difficult to continue the journey.

On the 21st November 1880, at Negapatam, on the South Indian Railway, an empty covered goods wagon was upset by the wind while standing at rest in a siding.

Numerous instances have occurred on the Indian Railway of trains being stopped, or nearly so, by the force of the wind.

NEW ZEALAND.

On the 11th September 1880, on the Rimutaka incline a train was blown over while crossing a gully which entered the main valley at right angles. The gauge of the railway is 3′ 6″, and the incline was worked by a Fell engine, which was situated in the middle of the train, having two passenger vehicles and a guard's van in front of it, and two luggage vans and an incline brakevan behind it. The carriages and van in front of the engine were first blown over: the front carriage went to pieces and the passengers in it were mostly killed; the other carriage and the van hung to the engine by the couplings. The goods vans and the other brakevan behind the engine retained their position on the rails for a minute or two, and then the goods vans were blown over.

FRANCE.

Five trains have been upset by the wind of the railway from Perpignan to Narbonne, between 1860 and 1868, as follows:—

On the 27th February 1860 a passenger train of six carriages, travelling at a speed of about 15 kilometres an hour, was blown off the line and rolled down the embankment. On the same day a luggage train was blown off the rails near Rivesaltes; six empty wagons were turned over, and dragged with them a loaded wagon; four trucks loaded with iron goods and three loaded wagons were not upset.

On the 19th January 1863 16 empty wagons standing on a siding at the station of Leucate were upset by the wind.

On the 11th February 1865 11 goods wagons standing on the same siding at Leucate were upset by the wind.

On the 5th December 1867 a passenger train travelling at a speed of about 30 kilometres an hour, and consisting of an engine and seven vehicles, one of which was a brakevan, was upset by the wind. All the carriages were thrown over, but the brakevan, which was heavier, merely left the rails.

APPENDIX F.

Statement showing the extent of the employment of Natives as Engine Drivers and Shunters on Guaranteed and State Railways during 1880.

Railways.	Number employed.		Observations of Railway Administrations.	Remarks.
	Engine Drivers and Shunters.	Firemen, &c.		
East Indian Railway	227	760	The further extension of the movement has for a time become somewhat limited on account of the want of education amongst the oldest classes of the native shunters and firemen. This obstacle to progress was anticipated as far back as 1875, when inducements were held out to the men to attend school after work hours. Finding that something further was required, departmental schools were introduced in 1877, and promotion to the grade of native fireman was made subject to the men attending school and showing some progress in one or other of the native languages. There are now 18 departmental schools established for this purpose, and the average daily attendance is about 400 men. Native firemen have been working on goods trains for the last 15 years; and the fact of no less than 760 men being on the staff at the present time is sufficient to prove that their employment is a success. As far as carefulness of their engines is concerned, it has been found that natives are as careful in that respect as Europeans with a similar length of service on the footplate. During the 6 years ending with 1880 a saving of about Rs. 15,95,924-3-10 has been effected. In ballast train drivers' wages a saving is now effected in this department of nearly Rs. 2,000 per month, or Rs. 24,000 annually. This represents the saving resulting from replacing only six European drivers by natives on the following districts, *viz.*, Howrah yard, Rampore Haut, Sahibgunge, Jumalpore, Allahabad (with Jubbulpore line), and Cawnpore. The cost in drivers' wages, overtime and allowance to these districts prior to native drivers being put in charge of the trains in April 1880 amounted to Rs. 2,140 per month, and it has now been reduced to Rs. 220 a month, showing a clear gain of 90 per cent. It has never been contemplated to work ballast trains with native guards, so that there is no drawback to the abovementioned savings by the substitution of native drivers.	
Madras Railway ...	...	...	The number of drivers working the trains now is less than the number on the books five years ago, and arrangements are in progress for the gradual introduction of native drivers; but it will be several years before any considerable number can be had, as those who have sought employment as firemen are not sufficiently intelligent ever to make drivers.	
South Indian Railway	20	...	Principally engaged doing shunting, driving special goods trains, and in some cases passenger trains on branch lines. It is impossible to get a better or educated class of natives to join the service, so as to become engine drivers; and even if they are willing, they are not physically capable of carrying out the duties necessary for an engine driver. Their caste prejudices interfere in many ways. The great drawback is want of education. Recruiting of European and Eurasian firemen has been stopped, and encouragement has been given to the best native firemen to qualify for drivers.	
Great Indian Peninsula Railway.	39	60	.....	

Statement showing the extent of the employment of Natives, &c.—continued.

Railways.	Number employed.		Observations of Railway Administrations.	Remarks.
	Engine Drivers and Shunters.	Firemen, &c.		
Bombay, Baroda and Central India Railway.	8	...	In addition to these, there are 2 West Indians, 9 Eurasians, 7 Portuguese, and 5 Parsees.	
Eastern Bengal Railway.	...	...	There are no natives in charge of locomotive engines at present. There are 18 European and Eurasian main line drivers and 9 shunters. It is considered absolutely necessary to adhere to the present system of employing Europeans and Eurasians as shunters.	
Oudh and Rohilkhand Railway.	57	...	Of the number noted, 26 were employed as drivers and 31 as shunters. The saving by employing the 26 drivers is Rs. 4,082 per month. Their working is reported as having been satisfactory, as they have been attentive and have given little cause of complaint. In cases of breakdowns also, they have on every occasion done creditably. Their education in English and the vernacular is, however, not so far advanced as is desirable; but the men feel the necessity of improving themselves in this direction, and are educating themselves in their spare time.	
Sind, Punjab and Delhi Railway.	38	191	In addition to the number shown, some 300 natives were employed in various capacities about the running sheds, a proportion of whom in time no doubt will be eligible as material to use on engines. The two men named drivers are employed on the Gazeeabad and Delhi Branch, and do their work very satisfactorily.	
Northern Bengal State Railway.	3	4	.....	
Tirhoot and Patna-Gya Railways.	2	...	One man is employed as a shunter to work the engine that takes the trains from Bazidpur to the Ghât, 7 miles, in order to save driver's overtime. He has done very well and has had no accidents. The other man does all the shunting in the Somastipur yard, and was appointed in place of a European dispensed with. He also runs goods trains when required.	
Calcutta and South-Eastern.	4	3	All the drivers and shunters employed on both lines are natives. The speed on these lines is slow and traffic small. The native drivers have so far given satisfaction. They are not so economical in fuel as Europeans, but there is considerable saving in cost of establishment.	
Nalhati State Railway	3	3		
Muttra-Hathras Railway.	4	...	One driver was promoted from fireman, 2 other drivers had been running for some years, and one new man was obtained who had been a driver. All natives. Their work has been generally satisfactory.	
Cawnpore and Farukhabad Railway.	...	...	Was not open for public traffic in 1880.	
Dildarnagar and Ghazipur and Sindia State Railways.	...	...	The Sindia State Railway is worked by European as well as native drivers with native firemen. The Dildarnagar branch was mostly worked by a European driver with 2 native firemen. The necessary arrangements for working entirely with native staff is not yet completed.	
Nizam's State Railway.	...	...	The full complement of drivers, including two Parsees, are employed. It is difficult, if not impossible, to procure native drivers.	
Bhavnagar-Gondal Railway.	...	...	Nothing has been done in the way of training natives as drivers and shunters.	
Rangoon and Irrawaddy Valley State Railway.	4	50	Natives of India or Burma are not employed as drivers, except upon suburban lines, in Rangoon. All first and second class firemen employed on this line are natives of India. Four natives of India are employed in driving and shunting, and 50 first and second class firemen.	

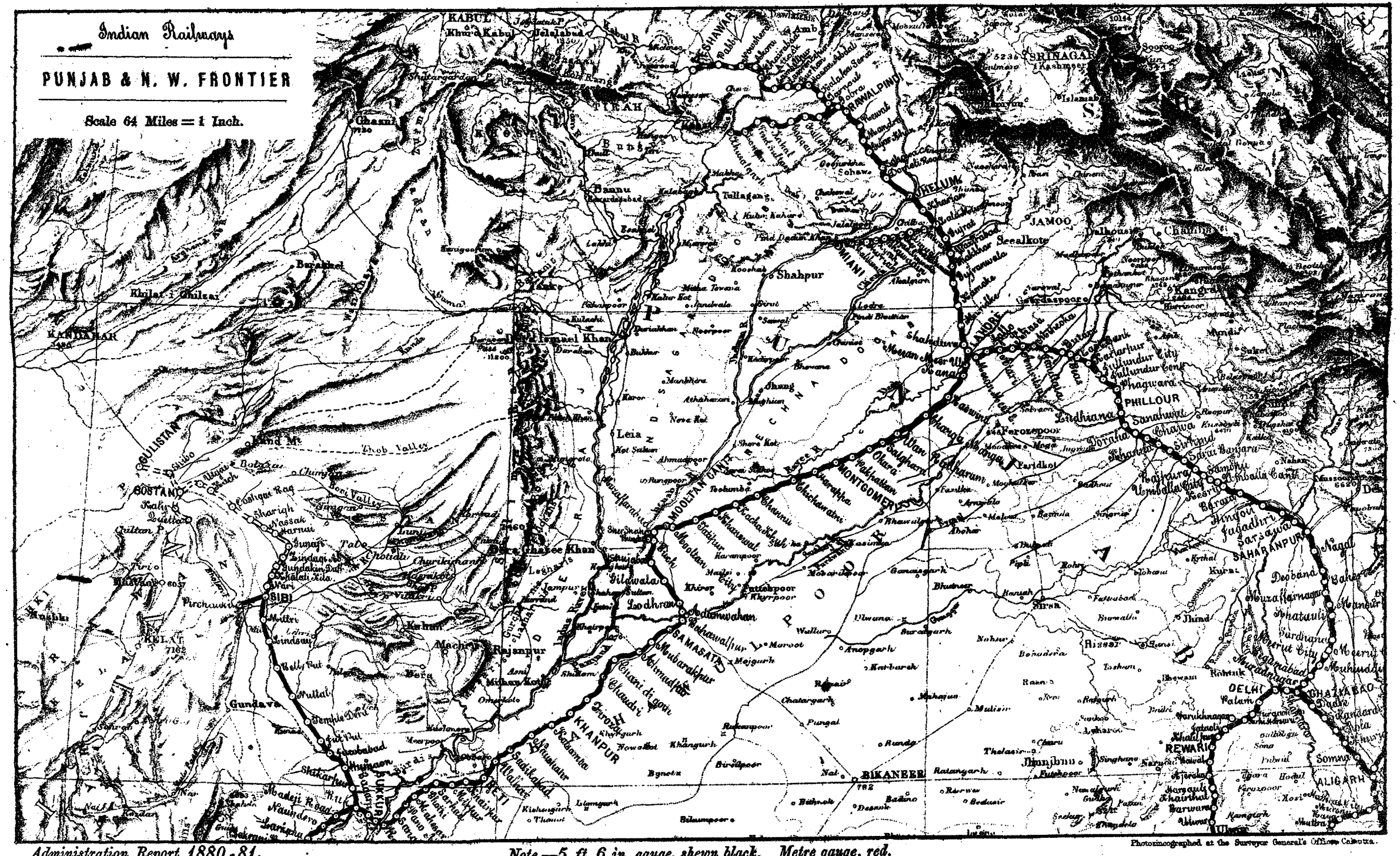
Statement showing the extent of the employment of Natives, &c.—concluded.

Railways.	Number employed.		Observations of Railway Administrations.	Remarks.
	Engine Drivers and Shunters.	Firemen, &c.		
Punjab Northern State Railway.	2	...	Employed as shunters; but owing to their defective knowledge of reading and writing, they are not qualified to be employed on the main line.	
Indus Valley State Railway.	11	...	Employed in shunting. It is under contemplation to run the whole Sibi-Ruk service with native drivers.	
Rajputana Railway ...	...	...	A statement is furnished to August 1881 showing that there are 4 native drivers and 15 shunters. On the whole, the performance of the 4 drivers may be deemed satisfactory. The shunters also work well, and 2 or 3 are recommended to work branch trains by their district officers. The advancement of native drivers is deemed slow. On the whole of the line there are but 4 men deemed capable of working trains. In time the gradual advancement of native firemen and shunters to drivers will increase. There is an advantage in employing them wherever a suitable man can be found.	
Holkar and Sindia-Neemuch Railway.	...	1	One native apprentice fireman was appointed on these lines in September 1880. Another native apprentice fireman was entertained in February 1881. Both have worked satisfactorily and have been favorably reported on. Owing to slackness of traffic, more men of this class have not been engaged.	

Indian Railways

PUNJAB & N. W. FRONTIER

Scale 64 Miles = 1 Inch.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Jalalabad
SHAWAR
Dawlatzai
Amb
SRINAGAR
Kashmeer
Islamabad
RAWALPINDI
PESHAWAR
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Ghazni
Bunér
Banu
Dera Ismael Khan
Tullagang
Sohawa
JHELUM
JAMOO
Dalhousie
Chamba
Sealkote
Shahpur
MIANI
LAHORE
Kangra
Shalimar
Amritsar
Kotlah
Batala
Jullundur City
Jullundur Cont
Phagwara
PHILLOUR
Ludhiana
Ferozepoor
Sanawur
Chaiva
Sirhind
Kalka
Umballa City
Umballa Cantt
Saharanpur
Deoband
Muzaffarnagar
Meerut City
Ghazeabad
DELHI
Palam
REWARI
ALIGARH
Somna
Jhunjhunu
BIKANEER
Ratangarh
Rewari
Narnaul
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Gurgaon
Pataudi
Rohtuk
Jhind
Sirsa
Fatehabad
Hansi
Hissar
Bhawani
Loharu
Dadri
Sikandrabad
Khurja
Bulandshahr
Aligarh
Hathras
Mutra
Agra
Bharatpur
Dholpur
Gwalior
Jhansi
Lahore
Montgomery
Mooltan Cant
Mooltan City
Shorkote
Jhang
Leia
Lodhran
Khanewal
Mian Mir
Wan
Bolgharry
Okara
Pakpattan
Chichawatni
Kachakizak
Khanpur
Bahawalpur
Ahmadpur
Mubarakpur
Samasata
Fazilka
Ferozepoor
Muktsar
Bhatinda
Rewari
Jullundur
Kotkapura
Faridkot
Moga
Ludhiana
Sirhind
Kalka
Umballa
Saharanpur
Meerut
Ghazeabad
Delhi
Rohtuk
Jhind
Sirsa
Hissar
Bhiwani
Loharu
Dadri
Aligarh
Hathras
Mutra
Agra
Bharatpur
Dholpur
Gwalior
Jhansi
Lahore
Montgomery
Mooltan
Shorkote
Jhang
Leia
Lodhran
Khanewal
Mian Mir
Wan

Indian Railways

INDUS VALLEY & KATTYAWAR

Scale 64 Miles = 1 Inch.

Photozincographed at the Surveyor General's Office, Calcutta.

Administration Report 1880-81.

Note.—5 ft. 6 in. gauge, shewn black. Metre gauge, red.

Indian Railways

RAJPUTANA & N. W. PROVINCES

Scale 64 Miles = 1 Inch.

Administration Report 1880-81.

Note.—5 ft. 6 in. gauge, shewn black. Metre gauge, red.

Photozincographed at the Surveyor General's Office, Calcutta.

Indian Railways
BENGAL & CENTRAL PROVINCES
Scale 64 Miles = 1 Inch.
Photozincographed at the Surveyor General's Office, Calcutta.
Note.—5 ft. 6 in. gauge, shewn black. Metre gauge, red.
Administration Report 1880-81.
CENTRAL PROVINCES
BENGAL
BERAR
NAGPOOR
ORISSA
DARJEELING
LUCKNOW
ALLAHABAD
Benares
MOGHAL SARAI
GYA
BUXAR
MOKAMEH
BANKIPORE
DINAPORE
SAMASTIPUR
SAIDPUR
KAUNIA
PARBATIPUR
Maldah
NAWADIH
SAHEBGUNGE
NALHATI
RAMPORE
BOALIA
SARA
BOSHEA
HOWRAH
CALCUTTA
BURDWAN
Midnapoor
Hazareebaugh
Ranchee
Sumbulpoor
CUTTACK
JUBBULPORE
NAGPUR
REWAH
SUTNA
Belaspoor
Nowgong
Goalpara
Jessore
Burrisaul
Dacca
Mymensing
Tura
Darjeeling
Punkhabaree
SILIGURI
Titalia
Domar
Dinajpoor
Raneegunge
Jamalpur
Monghyr
Bhagulpoor
Deogurh
Jynteah
Nuddeah
Kishnagur
Santipore
Serampore
Hooghly
Chinsurah
Bandel
Kidderpore
Diamond Harbour
Baruipore
Canning
Backergunj
Bullo
Comilla
Chittagong
Akyab
Sandoway
Ramree
Cheduba
Kyouk Phyoo
Arracan
Ganjam
Pooree
Chilka Lake
Dhamra R.
Palmyras
Point
Hooghly R.
Mutlah R.
Rajmahal Hills
Sontal Pergunnahs
Chota Nagpoor
Orissa
Bay of Bengal

Indian Railways

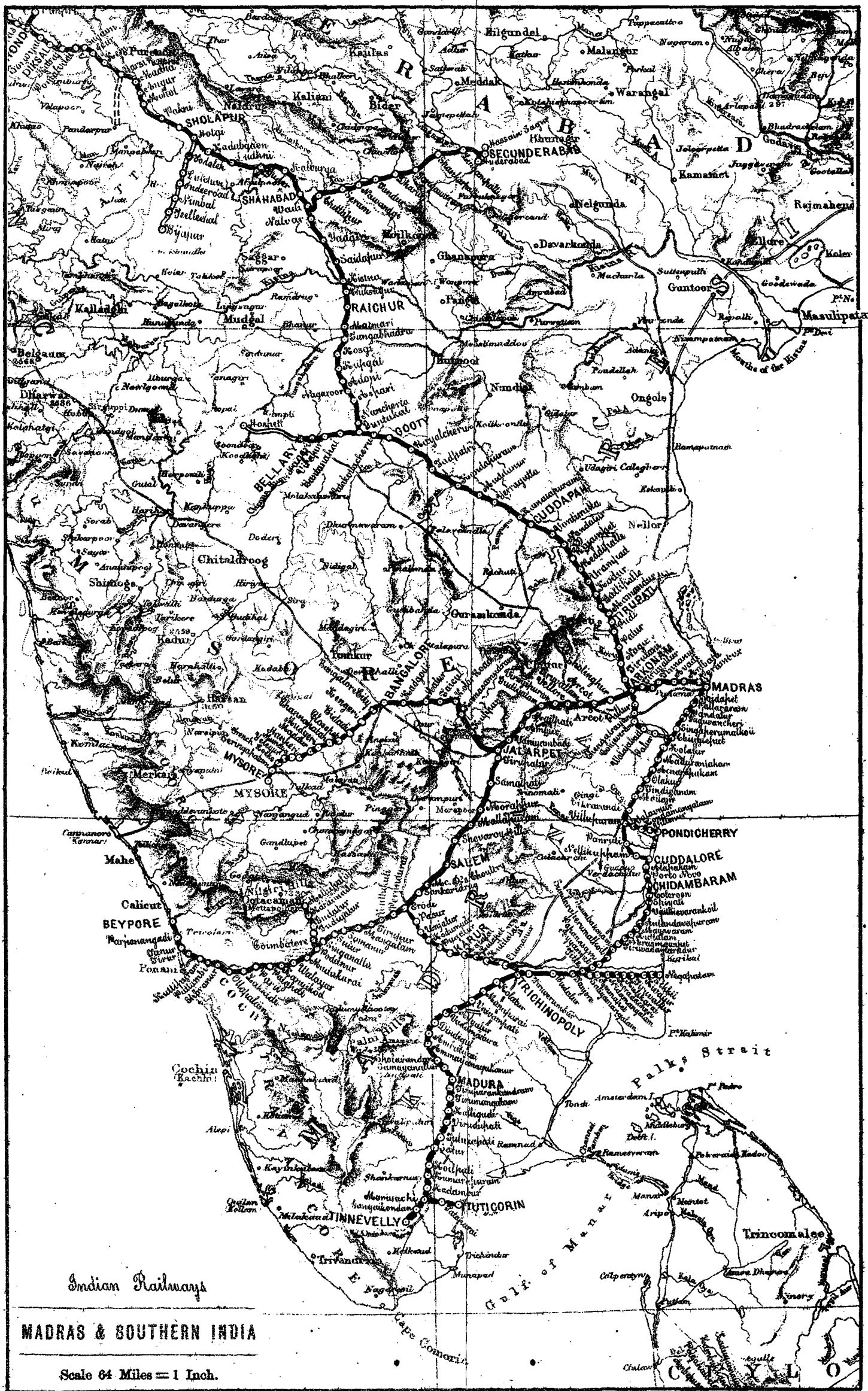
BOMBAY & RAJPUTANA

Scale 64 Miles = 1 Inch.

Photozincographed at the Surveyor General's Office, Calcutta.

Administration Report 1880-81.

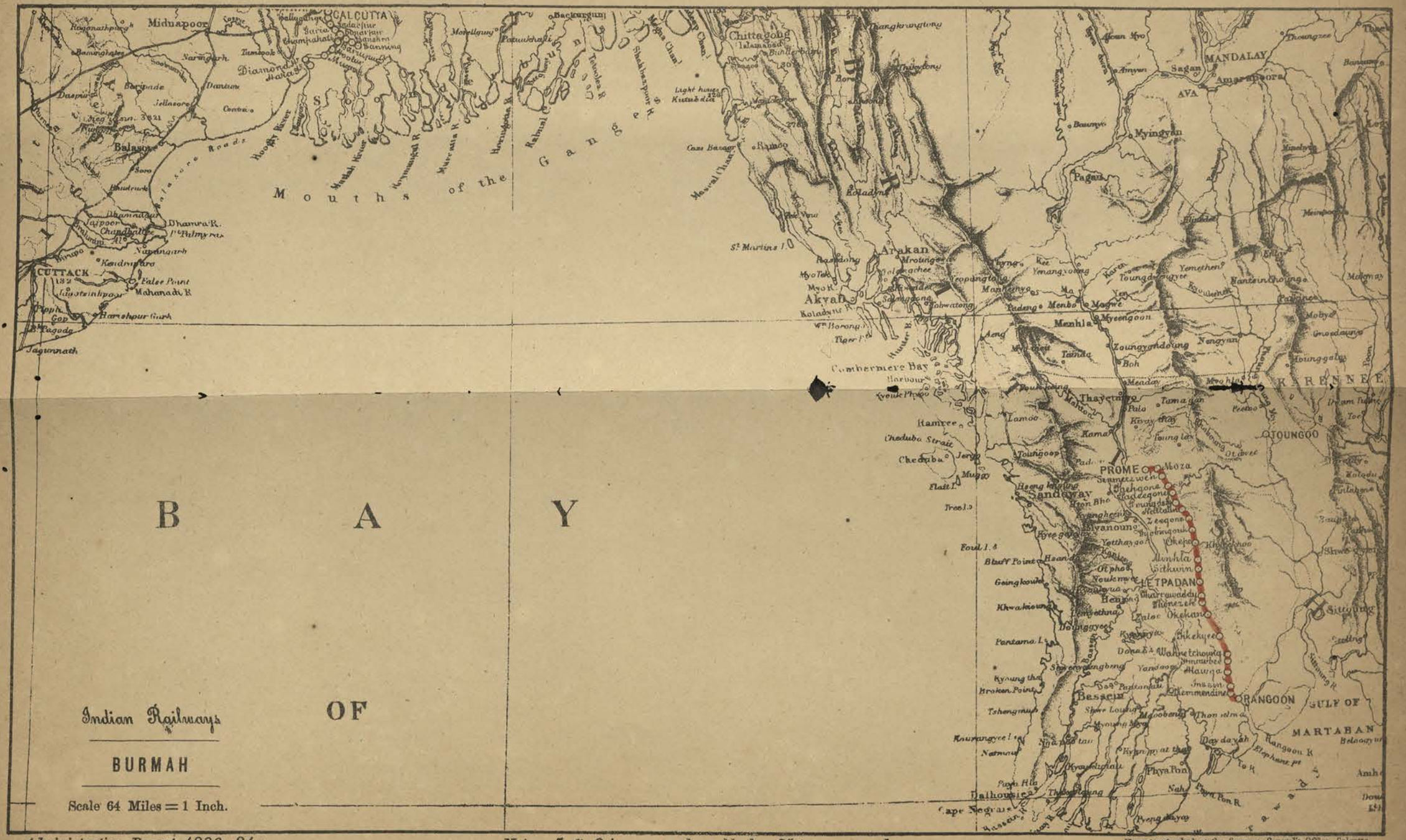
Note.—5 ft. 6 in. gauge, shewn black. Metre gauge, red.



Administration Report 1880-81.

Photozincographed at the Surveyor General's Office, Calcutta.

Note.—5 ft. 6 in. gauge, shewn black. Metre gauge, red.



Administration Report 1880-81.

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